ADDENDUM NO. 2 October 22, 2025
Colonial School District
John G. Leach School
Bid Package A

The Bid Due Date and Location have Changed
Bids are now due on Wednesday, November 19, 2025 @ 3:30 PM
At the Main Office of Gunning Bedford Middle School, 801 Cox Neck Road, New Castle, DE 19720
The last day for questions is Wednesday, November 12, 2025.

NOTICE: Attach this addendum to the project manual for this project. It modifies and becomes a part of the contract documents. Work or materials not specifically mentioned herein are to be described in the main body of the specifications and as shown in the drawings. Bidders shall acknowledge receipt of this addendum on the space provided on the Bid Form. Failure to do so may subject the bidder to disqualification.

The contract documents for the above referenced project, dated October 15, 2025, are amended as follows:

GENERAL CLARIFICATIONS:

1. Bid Documents may be viewed and downloaded at EDiS' FTP site. To obtain access to the FTP site, please submit your request via email to Crystal Watson, cwatson@ediscompany.com.
2. Physical copies of bids will be received at the Main Office of the Gunning Bedford Middle School, 801 Cox Neck Road, New Castle, DE 19720 until **3:30 PM local time on Wednesday, November 19, 2025.** The outer envelope should clearly indicate: "**COLONIAL SCHOOL DISTRICT – JOHN G LEACH SCHOOL – BID PACK A-__ SEALED BID – DO NOT OPEN"** Bids may be hand delivered or mailed/shipped. Electronic bids will not be accepted. Bidder assumes full responsibility for timely delivery at location designated for receipt of bids. Any bids received after the stated time will be returned unopened.
3. Bid Package A Pre-bid agenda dated October 21, 2025, is attached for your information.
4. Bid Package A Pre-bid sign-in sheet dated October 21, 2025, is attached for your information.

MODIFICATIONS TO SPECIFICATIONS:

1. See attached Bid Package A "Issued for Bidding" Specifications Volumes 1 through 3 dated October 15, 2025, which are being issued as part of this addendum.

MODIFICATIONS TO DRAWINGS:

1. See attached Bid Package A "Issued for Bidding" Drawings Volumes 1 through 2 dated October 15, 2025, which are being issued as part of this addendum.

LIST OF ATTACHMENTS:

Bid Package A Revised Advertisement for Bid
Bid Package A Pre-bid agenda
Bid Package A Pre-bid sign in sheet
CSD Leach BPA - Specifications Vol1
CSD Leach BPA - Specifications Vol 2
CSD Leach BPA - Specifications Vol 3
CSD Leach BPA - Drawings – Arch Vol 1
CSD Leach BPA - Drawings – Arch Vol 2
CSD Leach BPA - Drawings - Structural
CSD Leach BPA - Drawings – Civil Vol 1
CSD Leach BPA - Drawings – Civil Vol 2
CSD Leach BPA - Drawings – Civil Vol 3
CSD Leach BPA - Drawings – Civil Vol 4
CSD Leach BPA - Drawings - Food Service
CSD Leach BPA - Drawings – Pool
CSD Leach BPA - Drawings - MEP

End of Addendum No. 2

SECTION 001113 - ADVERTISEMENT FOR BID

Receipt of Bids

Public notice is hereby given that sealed bids for the following prime contracts will be received for the construction of the John G. Leach School located in New Castle, Delaware**. Bids will be received at Gunning Bedford Middle School, 801 Cox Neck Road, New Castle, DE 19720 until 3:30 PM local time on November 19, 2025,** at which time they will be publicly opened and read aloud. ***Bidder bears the risk of late delivery. Any bids received after the stated time will be returned unopened.*** The time and location of the bid opening may be extended with a minimum of two calendar day notice to the Bidders.

Contract: A-01 : SITEWORK
Contract: A-02 : LANDSCAPING
Contract: A-03 : CONCRETE
Contract: A-04 : MASONRY
Contract: A-05 : STRUCTURAL STEEL & MISCELLANEOUS METALS
Contract: A-06 : CARPENTRY AND GENERAL WORK
Contract: A-07 : ROOFING
Contract: A-08 : WATERPROOFING
Contract: A-09 : EXTERIOR METAL PANELS
Contract: A-10 : JOINT SEALANTS
Contract: A-11 : HOLLOW METAL AND FINISH HARDWARE
Contract: A-12 : GLASS AND GLAZING
Contract: A-13 : METAL STUDS AND DRYWALL
Contract: A-14 : CASEWORK AND MILLWORK
Contract: A-15 : CERAMIC TILE
Contract: A-16 : ACOUSTICAL CEILINGS
Contract: A-17 : PAINT AND VWC
Contract: A-18 : FLOORING
Contract: A-19 : FLUID-APPLIED FLOORING
Contract: A-20 : KITCHEN EQUIPMENT
Contract: A-21 : SWIMMING POOLS
Contract: A-22 : FIRE PROTECTION
Contract: A-23 : PLUMBING
Contract: A-24 : MECHANICAL
Contract: A-25 : BUILDING MANAGEMENT SYSTEMS
Contract: A-26 : ELECTRICAL
Contract: A-27 : SPECIAL SYSTEMS
Contract: A-28 : STRUCTURED CABLING
Contract: A-29 : TESTING ADJUSTING AND BALANCING

Bidding Documents

1. It is the responsibility of each bidder to review and coordinate all Project Documents. This includes plans, specifications, and addendums.
2. Bid documents, for review only, may be examined on the State of Delaware Online Bid Solicitation

Directory, http://bids.delaware.gov; on or after October 22, 2025

3. Bid documents will be available on the EDiS FTP site. In order to obtain access to biddable documents on the EDiS FTP site, bidders must download and complete the Plans Request form from http://bids.delaware.gov, and submit to: planrequests@delaware.gov for approval. Once the plans request is approved and you want to receive the biddable plans submit your request for access to the FTP site via email to Crystal Watson, cwatson@ediscompany.com. Your request should include the following information: your company name, contact name, contracts you are bidding, email address, and phone number.

Bid Security

A bid security in the amount of 10% of the bid, plus a consent of surety must accompany each bid. Bid Security shall specify the Owner as the obligee. Owner: Colonial School District.

Pre-Bid Meeting

A pre-bid meeting will be held at the office of the Construction Manager, EDiS Company, at 110 South Poplar Street, Suite 400, Wilmington, Delaware 19801 on October 21, 2025 at 2:00 PM local time. Attendance is highly suggested but not mandatory.

Questions

Please contact EDiS Company, Jason Hartman at 302-593-5230 or jhartman@ediscompany.com with questions.

Conformance to the Delaware Architectural Accessibility Act and the standards of the Architectural Accessibility Board is required on the Project.

Prevailing Wage Rates

Prevailing Wage Rates, as directed by Delaware Law, must be adhered to where applicable.

Pursuant to the Office of Management and Budget (OMB) "4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects" required that Contractors and Subcontractors who work on Large Public Works Contracts funded all or in part with public funds implement a Mandatory Drug Testing Program. The latest regulation can be downloaded from the following website:

http://regulations.delaware.gov/AdminCode/title19/4000/4100/4104.pdf

Drug Testing Requirements

Pursuant to the Office of Management and Budget (OMB) "4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects" required that Contractors and Subcontractors who work on Large Public Works Contracts funded all or in part with public funds implement a Mandatory Drug Testing Program. The latest regulation can be downloaded from the following website: http://regulations.delaware.gov/AdminCode/title19/4000/4100/4104.pdf

Craft Training for Public Works Procurement

In accordance with Delaware Code, Title 29, Chapter 69, Section 6962, requires: A public works contract must include a requirement that the contractor provide craft training for journeyman and apprentice levels if all of the following apply:

A. The project requires prevailing wages and,
B. The contractor or subcontractor employs 10 or more people and,
C. It is not a federal highway project, except for the Route 301 project.

The craft training may be provided by any of the following:

A. The contractor, or
B. The subcontractor, or
C. A program registered pursuant under Section 1101-4.0 of Title 19 of the Delaware Administrative Code.

Subsection 6902 defines "Craft Training" as "an apprenticeship program approved by and registered with any state apprenticeship agency or the United States Department of Labor. The Secretary of the Department of Labor shall maintain a list of crafts for which there are approved and registered training programs."

DELAWARE'S CONTRACTOR REGISTRATION ACT IS EFFECTIVE JULY 1, 2021
https://labor.delaware.gov/divisions/industrial-affairs/labor-law/contractor-registration-act/

END OF SECTION

AGENDA
Colonial School District
John G Leach School
Bid Package A
Pre-Bid Meeting 2:00 PM
21 October 2025

1. **Introduction**

Owner – CSD - Colonial School District [CSD holds all contracts]

- Drew Moffett, Director of Operations
- Stephen Johnson, Head of Facilities
- Scott Homes, Facilities Consultant

Design Team Members

- Studio JAED (Architect/FP/MEP)
- Site Studios (Civil Engineer)
- Baker Ingram & Associates (Structural Engineer)

EDiS Role – Construction Manager

- JD Bartlett, Operations Manager
- Jason Hartman, Sr. Project Manager
- Niles Arner, Project Engineer
- Larry Carroll, Superintendent

Attendees – Introductions from the attendees (Primes and Subcontractors)

2. **Project**

Overview:

- Address: 2460 Bear Corbitt Rd, New Castle, DE 19720
- Owner: Colonial School District (CSD)
- Project: John G. Leach School
- Building: 65,000 SF, Single Story
- Site: 19 acres
- Complete by Summer 2027
- CM-Agent (EDiS), all prime contracts with CSD

Contract: A-01 : SITEWORK
Contract: A-02 : LANDSCAPING
Contract: A-03 : CONCRETE
Contract: A-04 : MASONRY
Contract: A-05 : STRUCTURAL STEEL & MISCELLANEOUS METALS
Contract: A-06 : CARPENTRY AND GENERAL WORK

Contract: A-07 :	ROOFING
Contract: A-08 :	WATERPROOFING
Contract: A-09 :	EXTERIOR METAL PANELS
Contract: A-10 :	JOINT SEALANTS
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Contract: A-12 :	GLASS AND GLAZING
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Contract: A-15 :	CERAMIC TILE
Contract: A-16 :	ACOUSTICAL CEILINGS
Contract: A-17 :	PAINT AND VWC
Contract: A-18 :	FLOORING
Contract: A-19 :	FLUID-APPLIED FLOORING
Contract: A-20 :	KITCHEN EQUIPMENT
Contract: A-21 :	SWIMMING POOLS
Contract: A-22 :	FIRE PROTECTION
Contract: A-23 :	PLUMBING
Contract: A-24 :	MECHANICAL
Contract: A-25 :	BUILDING MANAGEMENT SYSTEMS
Contract: A-26 :	ELECTRICAL
Contract: A-27 :	SPECIAL SYSTEMS
Contract: A-28 :	STRUCTURED CABLING
Contract: A-29 :	TESTING ADJUSTING AND BALANCING

3. **Bid Information**
   - Bids will be received at Gunning Bedford Middle School, 801 Cox Neck Road, New Castle, DE 19720 until **3:00 PM local time on Wednesday, November 12, 2025**
   - Bid opening is public.
   - Three (3) copies of the bids should be in a sealed envelope clearly marked "**COLONIAL SCHOOL DISTRICT – JOHN G LEACH SCHOOL – BID PACK A-XX SEALED BID – DO NOT OPEN"** The bidder's name and address should also be marked on the envelope. Electronic bids will not be accepted.
   - Addenda are the only method to change the documents.
   - No addenda will be issued later than four (4) days prior to the bid opening, except when cancelling the bid, extending the bid opening date or changing the bid opening location.
   - Bid bonds are required.
   - Performance and Payment Bonds are required.
   - A Drug Testing Program is required. An affidavit of Employee Drug Testing Program is in Section 004100.
   - Craft Training Program is required. An affidavit is in Section 008115 and must be included.

- The bid form is in Section 004100 of the project manual. No modifications, clarifications or qualifications are allowed.

4. BP-A Addendum #1 was issued on 10/20/25. This document confirmed the date of the pre-bid meeting (10/21/25 @ 2:00PM).

5. BP-A Addendum #2 will be **issued on Wednesday, 22 October 2025.** Included in this addendum will be updated bidding documents identified as "BP-A Addendum #2 IFB, dated 10/15/25."

6. Section 002113 Instructions to Bidders/Review.

   - Note section regarding state requirements for cost impact due to tariffs.

7. Section 003132 Geo-Tech Reports.

8. Section 004100 Bid Forms – specific for each contract

9. Review Subcontractors List for each contract. Approved by group.

   - If anyone objects, state "does anyone else have objection?". If not, then the document will be modified to include.

10. Contract (Standard Form of Agreement Between Owner and Contractor), AIA A132/CMa 2019 Edition, is in Section 005200 of the project manual.

11. Supplement to AIA A132/CMa 2019 Edition is in Section 005200 of the project manual.

12. General Conditions of the Contract, AIA A232-2019 are in Section 007200.

13. Supplementary General Conditions are in Section 007300.

14. Scopes of Work are in Section 011100 (Summary of Work).

    - General sections – applies to all contractors
    - "Contract" sections – contract specific scopes

15. Review Site Logistic Requirements - Loading & unloading, onsite storage, site access, parking.
    - Provisions by sitework contractor

16. Allowances are defined in Section 012100 of the project manual, listed in the scopes of work, and on the bid forms.

17. Unit Costs are in Section 012200 of the project manual, listed in the scopes of work, and on the bid forms.

18. Alternates are in Section 012300 of the project manual. ***There are (11) alternates included in this bid package.*** Please review carefully.

19. Contractors are required to use the web-based project management system – Building Blok See Section 013125.

20. A pre-bid construction schedule can be found in Section 013216 of the project manual.

21. Insurance requirements are listed in Section 006216 of the project manual. (Pollution Insurance Required for select contracts, as indicated)

22. Safety program requirements are in Section 013523 of the project manual.

23. Prevailing wage rates must be followed. A copy of the current wage rates can be found in Section 007343 of the project manual.
    - Title 29 Del.C.6902(8) : Wage Rates on Custom Fabrications

      29 Del.C.6902(8):

      (8) "Custom fabrication" means the offsite fabrication, assembly, or other production of nonstandard goods or materials, including components, fixtures or parts thereof, specifically for a public works project. Such goods and materials shall include those used in the following trades or systems:

      a. Plumbing or pipe fitting systems, including heating, ventilating, air-conditioning, refrigeration systems, sheet metal or other duct systems.

      b. Electrical systems.

      c. Mechanical insulation work.

      d. Ornamental iron work.

      e. Commercial signage that does not attempt or appear to direct the movement of traffic on highways or roadways or interfere with, imitate, or resemble any official traffic sign, signal or device.

24. Submit questions in writing and e-mail to Jason Hartman, jhartman@ediscompany.com (302) 593-5230.

25. No questions after seven (7) days prior to bid.

26. A site visit is not mandatory but is encouraged. By submitting a proposal, the contractor bidding on the project attests that they have familiarized themselves with the site and all of the existing conditions affecting the work.

27. Documents may be viewed and downloaded at EDiS' FTP site after approval for circulation by CSD. Bidders requesting the log on information may obtain username and password permission by contacting Crystal Watson (EDiS Company) at cwatson@ediscompany.com, and Jackie McKee jmckee@ediscompany.com.

28. It is the responsibility of each Bidder to review and coordinate all Project Documents. This includes plans, specifications and addendums. All bidders must provide all requested contact information on Pre-Bid Meeting sign in sheet or email the information to Crystal Watson and Jackie McKee to receive notice of addendums.

29. EDiS POC: Jason Hartman at jhartman@ediscompany.com, (302) 593-5230.

EDiS COMPANY | TEL. (800) 995-EDiS • ediscompany.com

Colonial School District
John G. Leach School
Pre-Bid Meeting Bid Package A
21-Oct-25

Please Print!

REPRESENTATIVE:	ORGANIZATION / EMAIL
Jim McElroy JR	MS Painting / MSpainters@aol.com
Rick Barnhart	Corrado RBarnhart@Corrado.com
Ryne Johnson	Advantech / Ryne.Johnson@advantechsecurity.net
Matt Waters	Precision Door / MWaters@pdoor.com
Jason Holden	A-Del Estimates@A-del.com
Marcel Fene	Mumford and Miller Concrete / mfene@mumfordandmiller.com
John M. Peck	Garvey Roark, LLC john@garveyroark.com
Melissa Doran	D.A. Nolt, Inc. / matt@danolt.com
Luis Echevarria Jr	luisjr@smecontractors.com
Jim Howie	Ralph Degliobizzi & Sons Jim.Howie@degli.com
Lisa Nichols	Fidelity Power Systems / lnichols@fidelity-ps.com
Robin Schuerman	BRS Consulting robin@brsconic.com
JOSE WAMBAUGH	JOSE@ECPM.NET

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Colonial School District
John G. Leach School
Pre-Bid Meeting Bid Package A
21-Oct-25

Please Print!

REPRESENTATIVE:	ORGANIZATION / EMAIL
Dan Swengart	BSS Contractors BSmith@BSScontractors.com
Ian Murphy	Sobieski imurphy@sobieski.inc.com
Mike Keener	Sobieski mkeener@sobieski.inc.com
Marc Patone	D'Amore Mechanical mpatone@damoremechanical.net
Steve Newman	Reybold snewman@reybold.com
Julie Whitaker	jwhitaker@corporate-interiors.com
Jason Supp	R.L. Fabricators, Inc. jsupp@rlfabricators.com
Hunter Hendrickson	hunter@ri-core.com
JACK EBERT	DK Construction DKconstructionservices.com
Ty Sanderson	IDG / Tsanderson@IDGriffith.com
Thomas O'Flynn	Superior Electric thomas@superiorelectric.biz
MATT GREENLEE	Assurance Media Mgreenlee@assurancemedia.net
Chase Lockard	ModernComforts clockard@modernconfortsinc.com
Goutham Dass	Goutham@narissabldgco.com
Assiram Dass	adass@narissabldgco.com
Mark Reitsma	Farrell Roofing mreitsma@farrellroofing.com
Moraima Jaquez	Jaquez Concrete, LLC moraima@jaquezco.com

EDiS COMPANY | TEL. (800) 995-EDiS • ediscompany.com

Colonial School District
John G. Leach School
Pre-Bid Meeting Bid Package A
21-Oct-25

Please Print!

REPRESENTATIVE:	ORGANIZATION / EMAIL	
Tony Reynolds	Kent Constructors Co	Tony@Kentconstructionco.com
Dwayne Bosley	Kent Construction	Dwayne@Kentconstruction.
Ashley Gonzalez	Gaudelli Bros Inc	ashley@gaudellibros.com
Wendell House	Richard E. Pierson Construction	Whouse@repierson.com
John Hudechek	ACP	johnh@acpllc.com
Nick Pawter	TSC	N Pawter@tricastdesign.com
Zach Zapach	TSC	Z Zapach@tricastdesign.com
SCOTT CAPALDI	CRITICAL DESIGN & CONSTRUCTION	BIDS@CDACCORP.NET
Joe DiCioccio	JCI FIRE	JOSEPH.DICIOCCIO@JCI.COM

EDiS COMPANY | TEL. (800) 995-EDiS • ediscompany.com

Colonial School District
John G. Leach School
Pre-Bid Meeting Bid Package A
21-Oct-25

Please Print!

REPRESENTATIVE:	ORGANIZATION / EMAIL
PETE BOYER	GREGGO p.boyer@greggoundFerrore.com
JASON ROEBKE	jasonr@etshvac.com
Chris Sanna	csanna@tristatetheroofers.com
Doug Andrews	dandrews@crsreps.com

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Colonial School District
John G. Leach School
Pre-Bid Meeting Bid Package A
21-Oct-25

Please Print!

REPRESENTATIVE:	ORGANIZATION / EMAIL
MATT HEALY	MHEALY@NICKLE.EMAIL
JOEY STEPHENS	JSTEPHENS@NICKLE.EMAIL
PHILLIP SIMPSON	PSIMPSON@MASONBUILDING.COM
Matt Dunfee	MDunfee@BCI-online.com

Colonial School District
John G. Leach School
Pre-Bid Meeting Bid Package A
21-Oct-25

Please Print!

REPRESENTATIVE:	ORGANIZATION / EMAIL

COLONIAL SCHOOL DISTRICT
FACILITES AND SPECIAL PROJECTS
CONTRACT #4-23-01

VOLUME 1 OF 3

SPECIFICATIONS
FOR

JOHN G. LEACH SCHOOL

AT

2460 BEAR CORBITT ROAD
NEW CASTLE, DE 19720

PREPARED
BY

STUDIOJAED ARCHITECTS & ENGINEERS
2500 WRANGLE HILL ROAD
BEAR, DE 19701
STUDIOJAED PROJECT #22144

ISSUED FOR BID
OCTOBER 15, 2025

SECTION 00 01 07

SEALS PAGE

ARCHITECT – PROJECT MANAGER:

PAUL GUGGENBERGER, AIA, NCARB, LEED-AP
DE LICENSE NO. S5-0006548
PRINCIPAL
STUDIOJAED ARCHITECTS & ENGINEERS
2500 WRANGLE HILL ROAD, SUITE 110
BEAR, DE 19701
(302) 832-1652

STRUCTURAL ENGINEER:

FRANK M. YOUNG, PE
DEL LICENSE NO.13317
PRINCIPAL
BAKER, INGRAM & ASSOCIATES
1050 SOUTH STATE STREET
DOVER, DE 19901
302-734-7400
RESPONSIBLE FOR DIV. 03

MECHANICAL ENGINEER:

BRIAN ZIGMOND, P.E., C.E.M.
DE LICENSE NO. 12905
PRINCIPAL
STUDIOJAED ARCHITECTS & ENGINEERS
2500 WRANGLE HILL ROAD, SUITE 110
BEAR, DE 19701
(302) 832-1652

ELECTRICAL ENGINEER:

PARAG H. PATEL, P.E.
DE LICENSE NO. 10552
ELECTRICAL ENGINEER
STUDIOJAED ARCHITECTS & ENGINEERS
2500 WRANGLE HILL ROAD, SUITE 110
BEAR, DE 19701
(302) 832-1652

CIVIL ENGINEER:

JON SABATINO, P.E.
DE LICENSE NO.
ELECTRICAL ENGINEER
SITE STUDIOS, INC.
P.O. BOX 682
NORTH EAST, MD 21901
(443) 553-5455

END OF SECTION

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M-102	MECHANICAL HVAC PLAN - AREA B	A	10/22/2025	10/15/25	
M-103	MECHANICAL HVAC PLAN - AREA C	A	10/22/2025	10/15/25	
M-104	MECHANICAL HVAC PLAN - AREA D	A	10/22/2025	10/15/25	
M-105	MECHANICAL HVAC PLAN - BUS CANOPY AND CALLOUTS	A	10/22/2025	10/15/25	
M-106	MECHANICAL ROOF PLAN	A	10/22/2025	10/15/25	
M-201	MECHANICAL PIPING PLAN - AREA A	A	10/22/2025	10/15/25	
M-202	MECHANICAL PIPING PLAN - AREA B	A	10/22/2025	10/15/25	
M-203	MECHANICAL PIPING PLAN - AREA C	A	10/22/2025	10/15/25	
M-204	MECHANICAL PIPING PLAN - AREA D	A	10/22/2025	10/15/25	
M-400	REFRIGERANT PIPING SCHEMATICS	A	10/22/2025	10/15/25	
M-500	MECHANICAL SCHEDULES	A	10/22/2025	10/15/25	
M-600	MECHANICAL DETAILS	A	10/22/2025	10/15/25	
M-601	MECHANICAL DIAGRAMS	A	10/22/2025	10/15/25	
E-000	ELECTRICAL COVER SHEET	A	10/22/2025	10/15/25	
E-100	ELECTRICAL SITE PLAN	A	10/22/2025	10/15/25	
E-101	ELECTRICAL POWER PLAN - AREA A	A	10/22/2025	10/15/25	
E-102	ELECTRICAL POWER PLAN - AREA B	A	10/22/2025	10/15/25	
E-103	ELECTRICAL POWER PLAN - AREA C	A	10/22/2025	10/15/25	
E-104	ELECTRICAL POWER PLAN - AREA D	A	10/22/2025	10/15/25	
E-105	ELECTRICAL HVAC POWER PLAN - AREA A	A	10/22/2025	10/15/25	
E-106	ELECTRICAL HVAC POWER PLAN - AREA B	A	10/22/2025	10/15/25	
E-107	ELECTRICAL HVAC POWER PLAN - AREA C	A	10/22/2025	10/15/25	
E-108	ELECTRICAL HVAC POWER PLAN - AREA D	A	10/22/2025	10/15/25	
E-109	ELECTRICAL LIGHTING PLAN - AREA A	A	10/22/2025	10/15/25	
E-110	ELECTRICAL LIGHTING PLAN - AREA B	A	10/22/2025	10/15/25	
E-111	ELECTRICAL LIGHTING PLAN - AREA C	A	10/22/2025	10/15/25	
E-112	ELECTRICAL LIGHTING PLAN - AREA D	A	10/22/2025	10/15/25	
E-113	ELECTRICAL LIGHTING PLAN - BUS CANOPY AND CALLOUTS	A	10/22/2025	10/15/25	
E-114	ELECTRICAL FIRE ALARM PLAN - AREA A	A	10/22/2025	10/15/25	
E-115	ELECTRICAL FIRE ALARM PLAN - AREA B	A	10/22/2025	10/15/25	
E-116	ELECTRICAL FIRE ALARM PLAN - AREA C	A	10/22/2025	10/15/25	
E-117	ELECTRICAL FIRE ALARM PLAN - AREA D	A	10/22/2025	10/15/25	

E-200	ELECTRICAL ROOF PLAN	A	10/22/2025	10/15/25	
E-300	LIGHTING CONTROL RISER DIAGRAMS	A	10/22/2025	10/15/25	
E-301	LIGHTING CONTROL RISER DIAGRAMS	A	10/22/2025	10/15/25	
E-302	LIGHTING CONTROL RISER DIAGRAMS	A	10/22/2025	10/15/25	
E-500	ELECTRICAL DETAILS	A	10/22/2025	10/15/25	
E-501	ELECTRICAL DETAILS	A	10/22/2025	10/15/25	
E-502	ELECTRICAL DETAILS	A	10/22/2025	10/15/25	
E-503	ELECTRICAL DETAILS	A	10/22/2025	10/15/25	
E-600	ELECTRICAL SINGLE LINE DIAGRAM	A	10/22/2025	10/15/25	
E-601	ELECTRICAL PANEL SCHEDULES	A	10/22/2025	10/15/25	
E-602	ELECTRICAL PANEL SCHEDULES	A	10/22/2025	10/15/25	
E-603	ELECTRICAL PANEL SCHEDULES	A	10/22/2025	10/15/25	
E-604	ELECTRICAL PANEL SCHEDULES	A	10/22/2025	10/15/25	
T-000	TELECOM COVER SHEET	A	10/22/2025	10/15/25	
T-100	TELECOMMUNICATION SITE PLAN	A	10/22/2025	10/15/25	
T-101	TELECOMMUNICATIONS PLAN - AREA A&B	A	10/22/2025	10/15/25	
T-102	TELECOMMUNICATIONS PLAN - AREA C&D	A	10/22/2025	10/15/25	
T-500	TELECOMMUNICATION DETAILS	A	10/22/2025	10/15/25	
T-501	TELECOMMUNICATION DETAILS	A	10/22/2025	10/15/25	

END OF SECTION

SECTION 001113 - ADVERTISEMENT FOR BID

Receipt of Bids

Public notice is hereby given that sealed bids for the following prime contracts will be received for the construction of the John G. Leach School located in New Castle, Delaware**. Bids will be received at Gunning Bedford Middle School, 801 Cox Neck Road, New Castle, DE 19720 until 3:30 PM local time on November 19, 2025,** at which time they will be publicly opened and read aloud. ***Bidder bears the risk of late delivery. Any bids received after the stated time will be returned unopened.*** The time and location of the bid opening may be extended with a minimum of two calendar day notice to the Bidders.

Contract: A-01 : SITEWORK
Contract: A-02 : LANDSCAPING
Contract: A-03 : CONCRETE
Contract: A-04 : MASONRY
Contract: A-05 : STRUCTURAL STEEL & MISCELLANEOUS METALS
Contract: A-06 : CARPENTRY AND GENERAL WORK
Contract: A-07 : ROOFING
Contract: A-08 : WATERPROOFING
Contract: A-09 : EXTERIOR METAL PANELS
Contract: A-10 : JOINT SEALANTS
Contract: A-11 : HOLLOW METAL AND FINISH HARDWARE
Contract: A-12 : GLASS AND GLAZING
Contract: A-13 : METAL STUDS AND DRYWALL
Contract: A-14 : CASEWORK AND MILLWORK
Contract: A-15 : CERAMIC TILE
Contract: A-16 : ACOUSTICAL CEILINGS
Contract: A-17 : PAINT AND VWC
Contract: A-18 : FLOORING
Contract: A-19 : FLUID-APPLIED FLOORING
Contract: A-20 : KITCHEN EQUIPMENT
Contract: A-21 : SWIMMING POOLS
Contract: A-22 : FIRE PROTECTION
Contract: A-23 : PLUMBING
Contract: A-24 : MECHANICAL
Contract: A-25 : BUILDING MANAGEMENT SYSTEMS
Contract: A-26 : ELECTRICAL
Contract: A-27 : SPECIAL SYSTEMS
Contract: A-28 : STRUCTURED CABLING
Contract: A-29 : TESTING ADJUSTING AND BALANCING

Bidding Documents

1. It is the responsibility of each bidder to review and coordinate all Project Documents. This includes plans, specifications, and addendums.
2. Bid documents, for review only, may be examined on the State of Delaware Online Bid Solicitation

Directory, http://bids.delaware.gov; on or after October 22, 2025

3. Bid documents will be available on the EDiS FTP site. In order to obtain access to biddable documents on the EDiS FTP site, bidders must download and complete the Plans Request form from http://bids.delaware.gov, and submit to: planrequests@delaware.gov for approval. Once the plans request is approved and you want to receive the biddable plans submit your request for access to the FTP site via email to Crystal Watson, cwatson@ediscompany.com. Your request should include the following information: your company name, contact name, contracts you are bidding, email address, and phone number.

Bid Security

A bid security in the amount of 10% of the bid, plus a consent of surety must accompany each bid. Bid Security shall specify the Owner as the obligee. Owner: Colonial School District.

Pre-Bid Meeting

A pre-bid meeting will be held at the office of the Construction Manager, EDiS Company, at 110 South Poplar Street, Suite 400, Wilmington, Delaware 19801 on October 21, 2025 at 2:00 PM local time. Attendance is highly suggested but not mandatory.

Questions

Please contact EDiS Company, Jason Hartman at 302-593-5230 or jhartman@ediscompany.com with questions.

Conformance to the Delaware Architectural Accessibility Act and the standards of the Architectural Accessibility Board is required on the Project.

Prevailing Wage Rates

Prevailing Wage Rates, as directed by Delaware Law, must be adhered to where applicable.

Pursuant to the Office of Management and Budget (OMB) "4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects" required that Contractors and Subcontractors who work on Large Public Works Contracts funded all or in part with public funds implement a Mandatory Drug Testing Program. The latest regulation can be downloaded from the following website:

http://regulations.delaware.gov/AdminCode/title19/4000/4100/4104.pdf

Drug Testing Requirements

Pursuant to the Office of Management and Budget (OMB) "4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects" required that Contractors and Subcontractors who work on Large Public Works Contracts funded all or in part with public funds implement a Mandatory Drug Testing Program. The latest regulation can be downloaded from the following website: http://regulations.delaware.gov/AdminCode/title19/4000/4100/4104.pdf

Craft Training for Public Works Procurement

In accordance with Delaware Code, Title 29, Chapter 69, Section 6962, requires: A public works contract must include a requirement that the contractor provide craft training for journeyman and apprentice levels if all of the following apply:

A. The project requires prevailing wages and,
B. The contractor or subcontractor employs 10 or more people and,
C. It is not a federal highway project, except for the Route 301 project.

The craft training may be provided by any of the following:

A. The contractor, or
B. The subcontractor, or
C. A program registered pursuant under Section 1101-4.0 of Title 19 of the Delaware Administrative Code.

Subsection 6902 defines "Craft Training" as "an apprenticeship program approved by and registered with any state apprenticeship agency or the United States Department of Labor. The Secretary of the Department of Labor shall maintain a list of crafts for which there are approved and registered training programs."

DELAWARE'S CONTRACTOR REGISTRATION ACT IS EFFECTIVE JULY 1, 2021
https://labor.delaware.gov/divisions/industrial-affairs/labor-law/contractor-registration-act/

END OF SECTION

SECTION 00 21 13

INSTRUCTIONS TO BIDDERS

TABLE OF ARTICLES

1. GENERAL

2. BIDDER'S REPRESENTATION

3. BIDDING DOCUMENTS

4. BIDDING PROCEDURES

5. CONSIDERATION OF BIDS

6. POST-BID INFORMATION

7. PERFORMANCE BOND AND PAYMENT BOND

8. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

ARTICLE 1: GENERAL

1.1 DEFINITIONS

1.1.1 Whenever the following terms are used, their intent and meaning shall be interpreted as follows:

1.2 STATE: The State of Delaware.

1.3 AGENCY: Contracting State Agency as noted on cover sheet.

1.4 DESIGNATED OFFICIAL: The agent authorized to act for the Agency.

1.5 BIDDING DOCUMENTS: Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement for Bid, Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders (if any), General Conditions, Supplementary General Conditions, General Requirements, Special Provisions (if any), the Bid Form (including the Non-collusion Statement), and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, as well as the Drawings, Specifications (Project Manual) and all Addenda issued prior to execution of the Contract.

1.6 CONTRACT DOCUMENTS: The Contract Documents consist of the, Instructions to Bidders, Supplementary Instructions to Bidders (if any), General Conditions, Supplementary General Conditions, General Requirements, Special Provisions (if any), the form of agreement between the Owner and the Contractor, Drawings (if any), Specifications (Project Manual), and all addenda.

1.7 AGREEMENT: The form of the Agreement shall be AIA Document A101, Standard Form of Agreement between Owner and Contractor where the basis of payment is a STIPULATED SUM. In the case of conflict between the instructions contained therein and the General Requirements herein, these General Requirements shall prevail.

1.8 GENERAL REQUIREMENTS (or CONDITIONS): General Requirements (or conditions) are instructions pertaining to the Bidding Documents and to contracts in general. They contain, in summary, requirements of laws of the State; policies of the Agency and instructions to bidders.

1.9 SPECIAL PROVISIONS: Special Provisions are specific conditions or requirements peculiar to the bidding documents and to the contract under consideration and are supplemental to the General Requirements. Should the Special Provisions conflict with the General Requirements, the Special Provisions shall prevail.

1.10 ADDENDA: Written or graphic instruments issued by the Owner/Architect prior to the execution of the contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

1.11 BIDDER OR VENDOR: A person or entity who formally submits a Bid for the material or Work contemplated, acting directly or through a duly authorized representative who meets the requirements set forth in the Bidding Documents.

1.12 SUB-BIDDER: A person or entity who submits a Bid to a Bidder for materials or labor, or both for a portion of the Work.

1.13 BID: A complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

1.14 BASE BID: The sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids (if any are required to be stated in the bid).

1.15 ALTERNATE BID (or ALTERNATE): An amount stated in the Bid, where applicable, to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents is accepted.

1.16 UNIT PRICE: An amount stated in the Bid, where applicable, as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents.

1.17 SURETY: The corporate body which is bound with and for the Contract, or which is liable, and which engages to be responsible for the Contractor's payments of all debts pertaining to and for his acceptable performance of the Work for which he has contracted.

1.18 BIDDER'S DEPOSIT: The security designated in the Bid to be furnished by the Bidder as a guaranty of good faith to enter into a contract with the Agency if the Work to be performed or the material or equipment to be furnished is awarded to him.

1.19 CONTRACT: The written agreement covering the furnishing and delivery of material or work to be performed.

1.20 CONTRACTOR: Any individual, firm or corporation with whom a contract is made by the Agency.

1.21 SUBCONTRACTOR: An individual, partnership or corporation which has a direct contract with a contractor to furnish labor and materials at the job site, or to perform construction labor and furnish material in connection with such labor at the job site.

1.22 CONTRACT BOND: The approved form of security furnished by the contractor and his surety as a guaranty of good faith on the part of the contractor to execute the work in accordance with the terms of the contract.

1.23 CUSTOM FABRICATION: As defined in 29 Del. C. § 6902, the term “custom fabrication” means the offsite fabrication, assembly, or other production of non-standard goods or materials, including components, fixtures or parts thereof, specifically for a public works project. Such goods and materials shall include those used in the following trades or systems: (1) Plumbing or pipe fitting systems, including heating, ventilating, air-conditioning, refrigeration systems, sheet metal or other duct systems; (2) Electrical systems; (3) Mechanical insulation work; (4) Ornamental iron work; and (5) Commercial signage that does not attempt or appear to direct the movement of traffic on highways or roadways or interfere with, imitate, or resemble any official traffic sign, signal or device.

ARTICLE 2: BIDDER'S REPRESENTATION

2.1 PRE-BID MEETING

2.1.1 A pre-bid meeting for this project will be held at the time and place designated. Attendance at this meeting is a pre-requisite for submitting a Bid, unless this requirement is specifically waived elsewhere in the Bid Documents.

2.2 By submitting a Bid, the Bidder represents that:

2.2.1 The Bidder has read and understands the Bidding Documents and that the Bid is made in accordance therewith.

2.2.2 The Bidder has visited the site, become familiar with existing conditions under which the Work is to be performed, and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.

2.2.3 The Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception.

2.2.4 Bidder has accounted for the possibility of price increases due to the direct and indirect effect of tariffs, other international events, inflation, and supply chain interruptions. Change Orders will be denied if they are based upon any of these events. Bidder is expected to account for these possibilities and include them in the bid.

2.3 JOINT VENTURE REQUIREMENTS

2.3.1 For Public Works Contracts, each Joint Venturer shall be qualified and capable to complete the Work with their own forces.

2.3.2 Included with the Bid submission, and as a requirement to bid, a copy of the executed Joint Venture Agreement shall be submitted and signed by all Joint Venturers involved.

2.3.3 All required Bid Bonds, Performance Bonds, Material and Labor Payment Bonds must be executed by both Joint Venturers and be placed in both of their names.

2.3.4 All required insurance certificates shall name both Joint Venturers.

2.3.5 Both Joint Venturers shall sign the Bid Form.

2.3.6 Both Joint Venturers shall include their Federal E.I. Number with the Bid.

2.3.7 In the event of a mandatory Pre-bid Meeting, each Joint Venturer shall have a representative in attendance.

2.3.8 Due to exceptional circumstances and for good cause shown, one or more of these provisions may be waived at the discretion of the State.

2.4 ASSIGNMENT OF ANTITRUST CLAIMS

2.4.1 As consideration for the award and execution by the Owner of this contract, the Contractor hereby grants, conveys, sells, assigns and transfers to the State of Delaware all of its right, title and interests in and to all known or unknown causes of action it presently has or may now or hereafter acquire under the antitrust laws of the United States and the State of Delaware, relating to the particular goods or services purchased or acquired by the Owner pursuant to this contract.

ARTICLE 3: BIDDING DOCUMENTS

3.1 COPIES OF BID DOCUMENTS

3.1.1 Bidders may obtain complete sets of the Bidding Documents from the Architectural/Engineering firm designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein.

3.1.2 Bidders shall use complete sets of Bidding Documents for preparation of Bids. The issuing Agency nor the Architect assumes no responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

3.1.3 Any errors, inconsistencies or omissions discovered shall be reported to the Architect immediately.

3.1.4 The Agency and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall report any errors, inconsistencies, or ambiguities discovered to the Architect.

3.2.2 Bidders or Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request to the Architect at least seven days prior to the date for receipt of Bids. Interpretations, corrections and changes to the Bidding Documents will be made by written Addendum. Interpretations, corrections, or changes to the Bidding Documents made in any other manner shall not be binding.

3.2.3 The apparent silence of the specifications as to any detail, or the apparent omission from it of detailed description concerning any point, shall be regarded as meaning that only the best commercial practice is to prevail and only material and workmanship of the first quality are to be used. Proof of specification compliance will be the responsibility of the Bidder.

3.2.4 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all permits, labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work.

3.2.5 The Owner will bear the costs for all impact and user fees associated with the project.

3.3 SUBSTITUTIONS

3.3.1 The materials, products and equipment described in the Bidding Documents establish a standard of quality, required function, dimension, and appearance to be met by any proposed substitution. The specification of a particular manufacturer or model number is not intended to be proprietary in any way. Substitutions of products for those named will be considered, providing that the Vendor certifies that the function, quality, and performance characteristics of the material offered is equal or superior to that specified. It shall be the Bidder's responsibility to assure that the proposed substitution will not affect the intent of the design, and to make any installation modifications required to accommodate the substitution.

3.3.2 Requests for substitutions shall be made in writing to the Architect at least ten days prior to the date of the Bid Opening. Such requests shall include a complete description of the proposed substitution, drawings, performance and test data, explanation of required

installation modifications due the substitution, and any other information necessary for an evaluation. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval shall be final. The Architect is to notify Owner prior to any approvals.

3.3.3 If the Architect approves a substitution prior to the receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding.

3.3.4 The Architect shall have no obligation to consider any substitutions after the Contract award.

3.4 ADDENDA

3.4.1 Addenda will be mailed or delivered to all who are known by the Architect to have received a complete set of the Bidding Documents.

3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

3.4.3 No Addenda will be issued later than 2 calendar days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which extends the time or changes the location for the opening of bids.

3.4.4 Each bidder shall ascertain prior to submitting his Bid that they have received all Addenda issued, and shall acknowledge their receipt in their Bid in the appropriate space. Not acknowledging an issued Addenda could be grounds for determining a bid to be non-responsive.

ARTICLE 4: BIDDING PROCEDURES

4.1 PREPARATION OF BIDS

4.1.1 Submit the bids on the Bid Forms included with the Bidding Documents.

4.1.2 Submit the original Bid Form for each bid. Bid Forms may be removed from the project manual for this purpose.

4.1.3 Execute all blanks on the Bid Form.

4.1.4 Where so indicated by the makeup on the Bid Form, express sums in both words and figures, in case of discrepancy between the two, the written amount shall govern.

4.1.5 BID ALL REQUESTED ALTERNATES AND UNIT PRICES, IF ANY. If there is no change in the Base Bid for an Alternate, enter "No Change". The Contractor is responsible for verifying that they have received all addenda issued during the bidding period. Work required by Addenda shall automatically become part of the Contract.

4.1.6 Make no additional stipulations on the Bid Form and do not qualify the Bid in any other manner.

4.1.7 Each copy of the Bid shall include the legal name of the Bidder and a statement whether the Bidder is a sole proprietor, a partnership, a corporation, or any legal entity, and each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate

seal affixed. A Bid submitted by an agent shall have a current Power of Attorney attached, certifying agent's authority to bind the Bidder.

4.1.8 Bidder shall complete the Non-Collusion Statement form included with the Bid Forms and include it with their Bid.

4.1.9 In the construction of all Public Works projects for the State of Delaware or any agency thereof, preference in employment of laborers, workers or mechanics shall be given to bona fide legal citizens of the State who have established citizenship by residence of at least 90 days in the State.

4.1.10 Each bidder shall include a signed Affidavit for the Bidder certifying compliance with OMB Regulation 4104 - "Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on "Large Public Works Projects." "Large Public Works" is based upon the current threshold required for bidding Public Works as set by the Purchasing and Contracting Advisory Council.

4.2 BID SECURITY

4.2.1 All bids shall be accompanied by a deposit of either a good and sufficient bond to the agency for the benefit of the agency, with corporate surety authorized to do business in this State, the form of the bond and the surety to be approved by the agency, or a security of the bidder assigned to the agency, for a sum equal to at least 10% of the bid plus all add alternates, or in lieu of the bid bond a security deposit in the form of a certified check, bank treasurer's check, cashier's check, money order, or other prior approved secured deposit assigned to the State. The bid bond need not be for a specific sum, but may be stated to be for a sum equal to 10% of the bid plus all add alternates to which it relates and not to exceed a certain stated sum, if said sum is equal to at least 10% of the bid. The Bid Bond form used shall be the standard OMB form (attached). The bid bond may be an electronic bond and need not be transmitted as a paper document.

4.2.2 The Agency has the right to retain the bid security of Bidders to whom an award is being considered until either a formal contract has been executed and bonds have been furnished or the specified time has elapsed so the Bids may be withdrawn or all Bids have been rejected.

4.2.3 In the event of any successful Bidder refusing or neglecting to execute a formal contract and bond within 20 days of the awarding of the contract, the bid bond or security deposited by the successful bidder shall be forfeited.

4.3 SUBCONTRACTOR LIST

4.3.1 In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, each Bidder shall submit with their Bid a completed List of Sub-Contractors included with the Bid Form. NAME ONLY ONE SUBCONTRACTOR FOR EACH TRADE. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the Bidder will be using to perform the work and provide material for that subcontractor category. Should the Bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the Bidder shall list that third-tier contractor's full name and address (City & State). **If the Bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the Bidder intends to perform the work themselves, the Bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be

rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

4.3.2 It is the responsibility of the Contractor to ensure that their Subcontractors are in compliance with the provisions of this law. Also, if a Contractor elects to list themselves as a Subcontractor for any category, they must specifically name themselves on the Bid Form and be able to document their capability to act as Subcontractor in that category in accordance with this law.

4.4 AFFIDAVIT OF CONTRACTOR QUALIFICATIONS

4.4.1 In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, each Bidder shall submit with their Bid the Affidavit of Contractor Qualifications certifying that the Bidder will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term. After a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

4.5 AFFIDAVIT OF CRAFT TRAINING COMPLIANCE

4.5.1 In accordance with Title 29, Chapter 69, Section 6962(c)(13) of the Delaware Code, contractors and subcontractors must provide craft training for journeyman and apprentice levels if **all** of the following apply:

A. A project meets the prevailing wage requirement under Title 29, Chapter 69, Section 6960 of the Delaware Code.
B. The contractor employs 10 or more total employees.
C. The project is not a federal highway project

Failure to provide required craft training on the project may subject the successful contractor and/or subcontractor(s) to penalties as outlined in Title 29, Chapter 69, Section 6962(c)(13) of the Delaware Code.

Bidders shall submit the Affidavit of Craft Training Compliance prior to contract execution.

4.6 EQUALITY OF EMPLOYMENT OPPORTUNITY ON PUBLIC WORKS

4.6.1 During the performance of this contract, the contractor agrees as follows:

A. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, sex, color, sexual orientation, gender identity or national origin. The Contractor will take affirmative action to ensure the applicants are employed, and that employees are treated during employment, without regard to their race, creed, sex, color, sexual orientation, gender identity or national origin. Such action shall include, but not be limited to, the following: Employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in

conspicuous places available to employees and applicants for employment notices to be provided by the contracting agency setting forth this nondiscrimination clause.

B. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, sex, color, sexual orientation, gender identity or national origin."

4.7 PREVAILING WAGE REQUIREMENT

4.7.1 Wage Provisions: For renovation and new construction projects whose costs exceed the thresholds contained in Delaware Code, Title 29, Section 6960, the minimum wage rates for various classes of laborers and mechanics shall be as determined by the Department of Labor, Division of Industrial Affairs of the State of Delaware.

4.7.2 The employer shall pay all mechanics and labors employed directly upon the site of work, or engaged in custom fabrication work, as that term is defined in Article 1.23 herein and as also as defined in 29 Del. C § 6902 and described in 29 Del. C. § 6960(b), regardless of where the work is performed, unconditionally and not less often than once a week and without subsequent deduction or rebate on any account, the full amounts accrued at time of payment, computed at wage rates not less than those stated in the specifications, regardless of any contractual relationship which may be alleged to exist between the employer and such laborers and mechanics.

4.7.3 As per 29 Del. C. § 6960(b), the scale of the wages to be paid must be posted by the employer in a prominent and easily accessible place at the site of the work. There may be withheld from the employer so much of accrued payments as may be considered necessary by the Department of Labor to pay laborers and mechanics employed by the employer the difference between the rates of wages required by the contract to be paid laborers and mechanics on the work and rates of wages received by such laborers and mechanics to be remitted to the Department of Labor for distribution upon resolution of any claims.

4.7.4 Every contract based upon these specifications shall contain a stipulation that sworn payroll information, as required by the Department of Labor, be furnished weekly. The Department of Labor shall keep and maintain the sworn payroll information for a period of 6 months from the last day of the work week covered by the payroll.

4.8 SUBMISSION OF BIDS

4.8.1 Enclose the Bid, the Bid Security, and any other documents required to be submitted with the Bid.

4.8.2 Deposit Bids at the designated location prior to the time and date for receipt of bids indicated in the Advertisement for Bids. Bids received after the time and date for receipt of bids will be marked “LATE BID” and returned.

4.8.3 Bidder assumes full responsibility for timely delivery at location designated for receipt of bids.

4.8.4 Oral, telephonic, paper or telegraphic bids are invalid and will not receive consideration.

4.8.5 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids, provided that they are then fully in compliance with these Instructions to Bidders.

4.8.6 Compliance with Federal Bureau of Investigation rules mandates training for Contractors, Subcontractors, their employees, and custodial workers with access to locations that have access to Criminal Justice Information Services (CJIS). The contract awardee must have fingerprinting and background checks done for all Subcontractors and employees.

4.9 MODIFICATION OR WITHDRAW OF BIDS

4.9.1 Prior to the closing date for receipt of Bids, a Bidder may withdraw a Bid by personal request and by showing proper identification to the Architect. A request for withdraw by letter or fax, if the Architect is notified in writing prior to receipt of fax, is acceptable. A fax directing a modification in the bid price will render the Bid informal, causing it to be ineligible for consideration of award. Telephone directives for modification of the bid price shall not be permitted and will have no bearing on the submitted proposal in any manner.

4.9.2 Bidders submitting Bids that are late shall be notified as soon as practicable and the bid shall be returned.

4.9.3 A Bid may not be modified, withdrawn or canceled by the Bidder during a thirty (30) day period following the time and date designated for the receipt and opening of Bids, and Bidder so agrees in submitting their Bid. Bids shall be binding for 30 days after the date of the Bid opening.

ARTICLE 5: CONSIDERATION OF BIDS

5.1 OPENING/REJECTION OF BIDS

5.1.1 Unless otherwise stated, Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids will be made available to Bidders.

5.1.2 The Agency shall have the right to reject any and all Bids. A Bid not accompanied by a required Bid Security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

5.1.3 If the Bids are rejected, it will be done within thirty (30) calendar days of the Bid opening.

5.2 COMPARISON OF BIDS

5.2.1 After the Bids have been opened and read, the bid prices will be compared and the result of such comparisons will be made available to the public. Comparisons of the Bids may be based on the Base Bid plus desired Alternates. The Agency shall have the right to accept Alternates in any order or combination.

5.2.2 The Agency reserves the right to waive technicalities, to reject any or all Bids, or any portion thereof, to advertise for new Bids, to proceed to do the Work otherwise, or to abandon the Work, if in the judgment of the Agency or its agent(s), it is in the best interest of the State.

5.2.3 An increase or decrease in the quantity for any item is not sufficient grounds for an increase or decrease in the Unit Price.

5.2.4 The prices quoted are to be those for which the material will be furnished F.O.B. Job Site and include all charges that may be imposed during the period of the Contract.

5.2.5 No qualifying letter or statements in or attached to the Bid, or separate discounts will be considered in determining the low Bid except as may be otherwise herein noted. Cash or separate discounts should be computed and incorporated into Unit Bid Price(s).

5.2.6 Bidder must account for the possibility of price increases due to the direct and indirect effect of tariffs or other international events, inflation, and supply chain interruptions. Change Orders will be denied if they are based upon any of these events. Bidder is expected to account for these possibilities and include them in the bid.

5.3 DISQUALIFICATION OF BIDDERS

5.3.1 An agency shall determine that each Bidder on any Public Works Contract is responsible before awarding the Contract. Factors to be considered in determining the responsibility of a Bidder include:

A. The Bidder's financial, physical, personnel or other resources including Subcontracts;

B. The Bidder's record of performance on past public or private construction projects, including, but not limited to, defaults and/or final adjudication or admission of violations of the Prevailing Wage Laws in Delaware or any other state;

C. The Bidder's written safety plan;

D. Whether the Bidder is qualified legally to contract with the State;

E. Whether the Bidder supplied all necessary information concerning its responsibility; and,

F. Any other specific criteria for a particular procurement, which an agency may establish; provided however, that, the criteria be set forth in the Invitation to Bid and is otherwise in conformity with State and/or Federal law.

G. Any Bidder who is debarred in another State and/or by the United States Government is also debarred in Delaware.

5.3.2 If an agency determines that a Bidder is nonresponsive and/or nonresponsible, the determination shall be in writing and set forth the basis for the determination. A copy of the determination shall be sent to the affected Bidder within five (5) working days of said determination.

5.3.3 In addition, any one or more of the following causes may be considered as sufficient for the disqualification of a Bidder and the rejection of their Bid or Bids.

5.3.3.1 More than one Bid for the same Contract from an individual, firm or corporation under the same or different names.

5.3.3.2 Evidence of collusion among Bidders.

5.3.3.3 Unsatisfactory performance record as evidenced by past experience.

5.3.3.4 If the Unit Prices are obviously unbalanced either in excess or below reasonable cost analysis values.

5.3.3.5 If there are any unauthorized additions, interlineation, conditional or alternate bids or irregularities of any kind which may tend to make the Bid incomplete, indefinite or ambiguous as to its meaning.

5.3.3.6 If the Bid is not accompanied by the required Bid Security and other data required by the Bidding Documents.

5.3.3.7 If any exceptions or qualifications of the Bid are noted on the Bid Form.

5.4 ACCEPTANCE OF BID AND AWARD OF CONTRACT

5.4.1 A formal Contract shall be executed with the successful Bidder within twenty (20) calendar days after the award of the Contract.

5.4.2 Per Section 6962(d)(13)a., Title 29, Delaware Code, "The contracting agency shall award any public works contract within thirty (30) days of the bid opening to the lowest responsive and responsible Bidder, unless the Agency elects to award on the basis of best value, in which case the election to award on the basis of best value shall be stated in the Invitation To Bid. Any public school district and its board shall award public works contracts in accordance with this section's requirements except it shall award the contract within 60 days of the bid opening."

5.4.3 Each Bid on any Public Works Contract must be deemed responsive by the Agency to be considered for award. A responsive Bid shall conform in all material respects to the requirements and criteria set forth in the Contract Documents and specifications.

5.4.4 The Agency shall have the right to accept Alternates in any order or combination, and to determine the low Bidder on the basis of the sum of the Base Bid, plus accepted Alternates.

5.4.5 The successful Bidder shall execute a formal contract, submit the required Insurance Certificate, and furnish good and sufficient bonds, unless specifically waived in the General Requirements, in accordance with the General Requirement, within twenty (20) days of official notice of contract award. The successful Bidder shall provide, at least two business days prior to contract execution, copies of the Employee Drug Testing Program for the Bidder and all listed Subcontractors. Bonds shall be for the benefit of the Agency with surety in the amount of 100% of the total contract award. Said Bonds shall be conditioned upon the faithful performance of the contract. Bonds shall remain in affect for period of two (2) years after the date of the Certificate of Final Payment.

5.4.6 If the successful Bidder fails to execute the required Contract, Bond and all required information, as aforesaid, within twenty (20) calendar days after the date of official Notice of the Award of the Contract, their Bid guaranty shall immediately be taken and become the property of the State for the benefit of the Agency as liquidated damages, and not as a forfeiture or as a penalty. Award will then be made to the next lowest qualified Bidder of the Work or readvertised, as the Agency may decide.

5.4.7 Each bidder shall supply with its bid its taxpayer identification number (i.e., federal employer identification number or social security number) and should the vendor be awarded a contract, such vendor shall provide to the agency the taxpayer identification license numbers of such subcontractors. Such numbers shall be provided on the later of the date on which such subcontractor is required to be identified or the time the contract is executed. The successful Bidder shall provide to the agency to which it is contracting, within 30 days of entering into such public works contract, copies of all Delaware Business licenses of subcontractors and/or independent contractors that will perform work for such public works contract. However, if a subcontractor or independent contractor is hired or contracted more than 20 days after the Bidder entered the public works contract the Delaware Business license of such subcontractor or independent contractor shall be provided to the agency within 10 days of being contracted or hired.

5.4.8 The Bid Security shall be returned to the successful Bidder upon the execution of the formal contract. The Bid Securities of unsuccessful bidders shall be returned within thirty (30) calendar days after the opening of the Bids.

ARTICLE 6: POST-BID INFORMATION

6.1 CONTRACTOR'S QUALIFICATION STATEMENT

6.1.1 Bidders to whom an award of a Contract is under consideration shall, if requested by the Agency, submit a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a statement has been previously required and submitted.

6.2 Bidders to whom an award of a Contract has been made must produce their Delaware Business License before the Contract can be executed.

ARTICLE 7: PERFORMANCE BOND AND PAYMENT BOND

7.1 BOND REQUIREMENTS

7.1.1 The cost of furnishing the required Bonds, that are stipulated in the Bidding Documents, shall be included in the Bid.

7.1.2 If the Bidder is required by the Agency to secure a bond from other than the Bidder's usual sources, changes in cost will be adjusted as provide in the Contract Documents.

7.1.3 The Performance and Payment Bond forms used shall be the standard OMB forms (attached).

7.2 TIME OF DELIVERY AND FORM OF BONDS

7.2.1 The bonds shall be dated on or after the date of the Contract.

7.2.2 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix a certified and current copy of the power of attorney.

7.2.3 The Performance Bond and/or the Payment Bond may be electronic bonds and need not be transmitted as paper documents.

ARTICLE 8: FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

8.1 Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment is a Stipulated Sum.

END OF SECTION

SECTION 003132 – GEOTECHNICAL DATA

1. GENERAL

A. Owner's Disclaimer

1. Site Information: Data on subsurface conditions are made available in the Bidding Documents as a convenience to Bidders and the Contractor. They are not intended as representations or warrants of continuity of such conditions between soil borings. It shall be expressly understood that the Owner will not be responsible for interpretations or conclusions drawn there from by the Contractor. Additional test borings and other exploratory operations may be made by the Contractor at no additional cost to the Owner, provided such operations are acceptable to the Architect and Construction Manager.

B. SOIL BORING DATA

1. Boring logs and location plans are included in this section of the project manual. All Contractors are strongly urged to review this information.

END OF SECTION

February 6, 2025

Brian Morgan, PLA, LEED AP
Site Studios, Inc.
PO Box 682
North East, MD 21901

RE: Project No. CG.4054.GA
Geotechnical Evaluation
Proposed John G. Leach School
2460 Bear Corbitt Road
Delaware City, Delaware

Dear Mr. Morgan:

CGC Geoservices, LLC (CGCG) has completed our geotechnical investigation for the proposed John G. Leach School to be constructed at 2460 Bear Corbitt Road in Delaware City, Delaware. The purpose of these services was to evaluate the subsurface conditions in the vicinity of the proposed school building and to provide recommendations regarding the design and construction of the foundations and building slab. This work has been performed in accordance with the agreement between Site Studios, Inc. and CGCG dated October 18, 2024, authorized to proceed on November 4, 2024. CGCG provided a report dated February 5, 2025 summarizing the field testing and recommendations for the proposed stormwater management features at the site.

To assist with the preparation of this report, CGCG was provided with the following:

- A boring location plan indicating locations and depths of borings and infiltration tests for proposed stormwater features; and

- A preliminary geotechnical evaluation for the site, prepared by Duffield Associates, dated July 24, 2020.

Based on this information, we understand that it is proposed to construct a new educational facility at the site. The proposed 64,500 sf school building will be centrally located on the site, with parking areas and subsurface stormwater detention to the north side of the building. A surface stormwater management basin is proposed to the south of the school.

A finished floor elevation of 57.5 feet is proposed for the structure. Based on the grading plan provided, net cuts and fills of up to 6 feet will be required for the building pad. No structural loading information was provided. We have assumed that the structure will be a single story building.

The project site is bounded by Bear Corbitt Road (SR7) to the east and SR1 to the west, and is approximately ¼ mile north of Wrangle Hill Road (SR72). At the time of this evaluation, the site was a gently sloping, former agriculture field surrounded by a treeline. The existing site grades are shown on the enclosed boring location sketch. The site generally slopes downwards to the south and east.

FIELD AND LABORTORY TESTING PROGRAM

Prior to the start of field work, a Miss Utility ticket was placed to obtain markout of public utilities. Active underground utilities were identified along the site perimeter by Miss Utility. No utility corridors were identified by Miss Utility within the proposed building footprint.

Geotechnical fieldwork was performed on November 12, 2024. A total of 4 test borings, designated B-1 to B-4, were performed within the footprint of the proposed building. The borings were extended to a depth of up to 36 feet below grade. A test boring location plan is enclosed with this report. Boring locations were estimated by CGCG using GPS coordinates. No survey was performed.

The Standard Penetration Test (SPT) borings were performed by CGCG utilizing a track mounted CME 55 drill rig with hollow stem augers. The performance of the borings was reviewed by a representative of CGCG. Test boring logs describing the conditions encountered are enclosed with this report.

Upon completion of testing, the borings were backfilled with the drill cuttings mixed with bentonite grout. No additional compactive effort or site restoration was performed. Additional settlement and softening of the soil replaced in the test boring may occur, resulting in a depression or hole in the ground surface. Consequently, future maintenance and restoration of the site may be required.

Soil samples were returned to the office for further review and testing of selected samples. Index testing was performed on selected samples to assist in classification and estimating of engineering properties of the soil. These test results are included on the enclosed boring logs. No environmental sampling or testing was performed.

SUBSURFACE CONDITIONS

A. REGIONAL GEOLOGY

Regional mapping by the Delaware Geological Survey identifies the project area within the Coastal Plain Physiographic Province. The Delaware Geological Survey mapping indicates that the project site is underlain by the Columbia Formation, which consists of cross-bedded feldspathic quartz sand and gravel, with beds of clayey silt and clay. The Coastal Plain sediments in the project area are mapped to be on the order of 850 to 1000 feet in depth.

B. SITE SUBSURFACE STRATIGRAPHY

Beneath the surface cover of grass, vegetation and former crop cover, the site conditions generally consisted of a thin surficial layer of stiff consistency silt soils with some organics overlying predominately granular soils to the extent of the borings. The sand stratum contained lenses and layers of medium to stiff consistency clay at various depths in some borings. These soils generally appeared natural and undisturbed.

Groundwater was observed in two of the test borings at depths of 21.6 to 23.5 feet below grade, corresponding to approximately elevation 31 to 34, site datum. Groundwater was not observed in the other two test borings, which terminated at elevation 34 to 36. The borings were not kept open for a period of time for the groundwater level to stabilize.

For discussion purposes, the subsurface conditions encountered can be further described as follows.

STRATUM	APPROXIMATE THICKNESS (FT)	GENERALIZED DESCRIPTION
A	2	Dark brown/ brown SILT, little to and fine sand, trace organics (stiff consistency) USCS: ML
B	---- [1]	Brown/ red, fine to coarse SAND, little to some gravel, trace to some, silt, trace to little clay (loose to medium density) USCS: SM, SC
C	0.5 – 4 [2]	Orange/ brown CLAY, little to and fine sand, little silt, trace organics (very soft to stiff consistency) USCS: CL
NOTES:	1. Stratum B not fully penetrated 2. Stratum C not encountered in boring B-2. Stratum C interlayered with Stratum B.	

CONCLUSIONS AND RECOMMENDATIONS

A. DESIGN

1. **Foundation Bearing and Settlement**. Based on the subsurface conditions encountered in the test borings, as well as review of the other test boring information provided in the preliminary geotechnical report for the site, the site soils should be suitable for supporting a typical spread foundation and slab on grade. It is recommended that the foundations be founded on the natural site soils, prepared as discussed herein, or on controlled structural fill placed over the natural site soils.

   A shallow foundation bearing on these soils, prepared as discussed herein, should be designed for a **maximum net allowable bearing pressure of 3,000 psf**.

   The base of all spread footings should be placed at least 32 inches below final exterior grades to reduce the risk of frost heave. Subgrade should be reviewed and prepared as recommended herein. If a winter construction schedule is proposed for the foundations, provisions for the protection of shallow foundations from frost heave during construction should be included in the contract documents. Subgrade should be reviewed and prepared as recommended herein.

   A spread footing founded on soils as described herein should experience a total settlement of 1 inch or less, with most settlement occurring quickly after dead load application (i.e., during construction). For areas of the building where bulk fill is required, some fill-induced settlement will occur due to the load of the fill material. However, based on the soil profile at the site, this settlement should occur quickly, during construction.

2. **Soil Parameters.** The following soil parameters are recommended for lateral earth loading and analysis:

	Stratum A Sandy Silt (stiff)	Stratum B Sand (loose to medium)	Imported Granular Structural Fill
Moist Unit Weight (pcf)	125	125	130
Cohesion (psf)	0	0	0
Angle of Internal Friction	26	32	34
At Rest Earth Coefficient, K_O	0.56	0.47	0.44
Active Earth Pressure Coefficient, K_A	0.39	0.31	0.28
Passive Earth Pressure Coefficient, K_P	2.56	3.26	3.54
Coefficient of Sliding Friction	0.32	0.39	0.42

3. **Bulk Excavation Safety.** Excavation may be required on site for utility construction. Such excavations will requiring benching, sloping or bracing to remain stable during construction. Based on the site soils, a Type C soil profile should be considered for excavations, with excavations sloped at a maximum of 1.5:1 (horizontal to vertical). All excavation bracing, if required, should be designed by a qualified Professional Engineer registered in the State of Delaware

   Excavated materials should not be stockpiled along the top of braced or sloped excavations. Sloped or braced excavations should be routinely reviewed during construction to assure that surface water runoff or groundwater seepage into the excavation is not weakening the sidewall area.

4. **Seismic Design Parameters.** Based on subsurface conditions encountered during the field exploration at the site and review of regional geologic maps, Site Class “D” is recommended for the analysis of seismic conditions, as defined by Table 1613.2.5(1) and 1613.2.5(2) of the 2018 International Building Code.

B. CONSTRUCTION

1. **Proofrolling and Subgrade Preparation.** At the start of construction, all surficial vegetation and organics should be removed in their entirety in the proposed building footprint. Due to the previous use of the site for agricultural purposes, the thickness of organics may vary.

   Following rough grading and prior to footing excavation or placement of fill, it is recommended that the exposed subgrade be proofrolled with a minimum 10-ton vibratory roller of fully loaded tandem-wheel dump truck in the presence of a qualified soils technician working under the supervision of a geotechnical engineer.

   The purpose of the proofrolling is to densify the existing subgrade and to identify localized soft surficial conditions in the exposed subgrade. Yielding subgrade conditions encountered with the proposed building area which cannot be densified in place should be undercut to firm subgrade conditions and be backfilled in accordance with the recommendations of this report.

2. **Foundation Subgrade Review.** All shallow foundations should be placed on firm, dry, non-frozen subgrade. Shallow foundations should be constructed on natural site soils beneath the surficial layer of organics, if encountered, or on compacted structural fill placed on the natural site soils. Foundation excavations should be reviewed by a qualified technician working under the supervision of a geotechnical engineer who is familiar with the recommendations of this report.

3. **Protection of Subgrade Soils.** If shallow foundation excavations are left open, precipitation may result in the collection of water within the excavation. Provisions for removal of water by drainage or sumping are recommended. Subgrade soils disturbed by precipitation should be either scarified and re-compacted, or undercut and replaced with structural fill as previously discussed. It is recommended that foundation subgrade areas be overexcavated by up to 4 inches and covered with clean stone, such as AASHTO 57 stone, to provide protection and to allow for sumping of water that may enter the excavation.

4. **Compaction Requirements.** Structural fill utilized within the proposed structural areas should be placed in loose lifts with a maximum thickness of 8 inches. Each lift placed within the proposed structure areas (defined as the area extending 1 horizontal to 1 vertical beyond the perimeter) should be compacted to at least 95% of the maximum dry density as determined by the Modified Proctor (ASTM D 1557) test. Structural fill for pavement areas and utility trenches located outside of the proposed structural area, should be compacted to at least 90% of the maximum dry density. The placement and

compaction of structural fill should be monitored on a full-time basis by a qualified technician under the supervision of a geotechnical engineer.

5. **Re-Use of On-Site Soils as Structural Fill.** The shallow site soils will consist primarily of sandy silt or silty sand/ sand soils of Stratum A and B. Soils containing organics or debris are not considered suitable for reuse as structural fill and should be disposed of off site. Soils containing organics could be utilized as fill in landscape/ non-structural areas of the site. Sandy silt or silty sand soils that are free of organics or debris may be suitable for use as fill if they are maintained at a moisture content that will allow for the specified degree of compaction.

6. **Imported Structural Fill.** Imported structural fill, if needed, should consist of predominately granular soils conforming to the following requirements:

Sieve Size	% Passing
1 ½"	100
No. 4	50 – 100
No. 10	25 –75
No. 200	≤ 25

AASHTO SP-57 stone or graded aggregate can also be utilized as structural fill, and should be considered where localized, relatively deep fills are required. AASHTO SP-57 stone should also be utilized as fill where drainage is required.

7. **Groundwater Control.** Groundwater was encountered during the performance of the test borings at depths of 22 to 23 feet below grade. Actual static groundwater levels at the site are likely to be affected by seasonal and annual variations in precipitation.

   It is assumed that bulk excavations for foundation construction will not encounter groundwater conditions. If "perched" groundwater conditions are encountered during construction, water should be removed prior to foundation construction. Additionally, localized sumping may be required if perched groundwater conditions are observed. Foundation area may need to be overexcavated by a minimum of 4 inches and backfilled with AASHTO SP 57 stone to facilitate sumping and protect the exposed subgrade during construction.

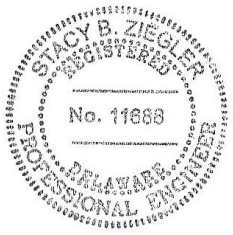
8. **Subsurface Data.** All contractors interested in bidding on phases of this work which involve subsurface conditions should be given full access to this report, so that they can develop their own interpretations of the available data.

These recommendations have been prepared according to generally accepted soil and foundation engineering standards and are based on the conditions encountered at the sampled locations. It is noted that, although soil quality has been inferred from the interpolation of the data, subsurface conditions between the sampled locations are, in fact, unknown. As a result, these recommendations may require modifications based on the conditions encountered and exposed during construction excavation. Should any conditions encountered during construction differ from those described in this report, this office should be notified immediately in order to review and possibly modify these recommendations. The cost for this construction review is not part of our existing agreement. This report applies solely to the size, type, and location of the structures described herein. In the event that changes are proposed, this report will not be considered valid unless the changes have been reviewed and the recommendations of this report modified and reapproved in writing by CGC Geoservices, LLC.

We have appreciated the opportunity to assist you on this project. If there are any questions regarding the enclosed, please do not hesitate to contact us.

Very truly yours,

CGC GEOSERVICES, LLC



Stacy B. Ziegler, P.E., LEED AP BD+C
Senior Geotechnical Engineer
Delaware Professional Engineer License No. 11688

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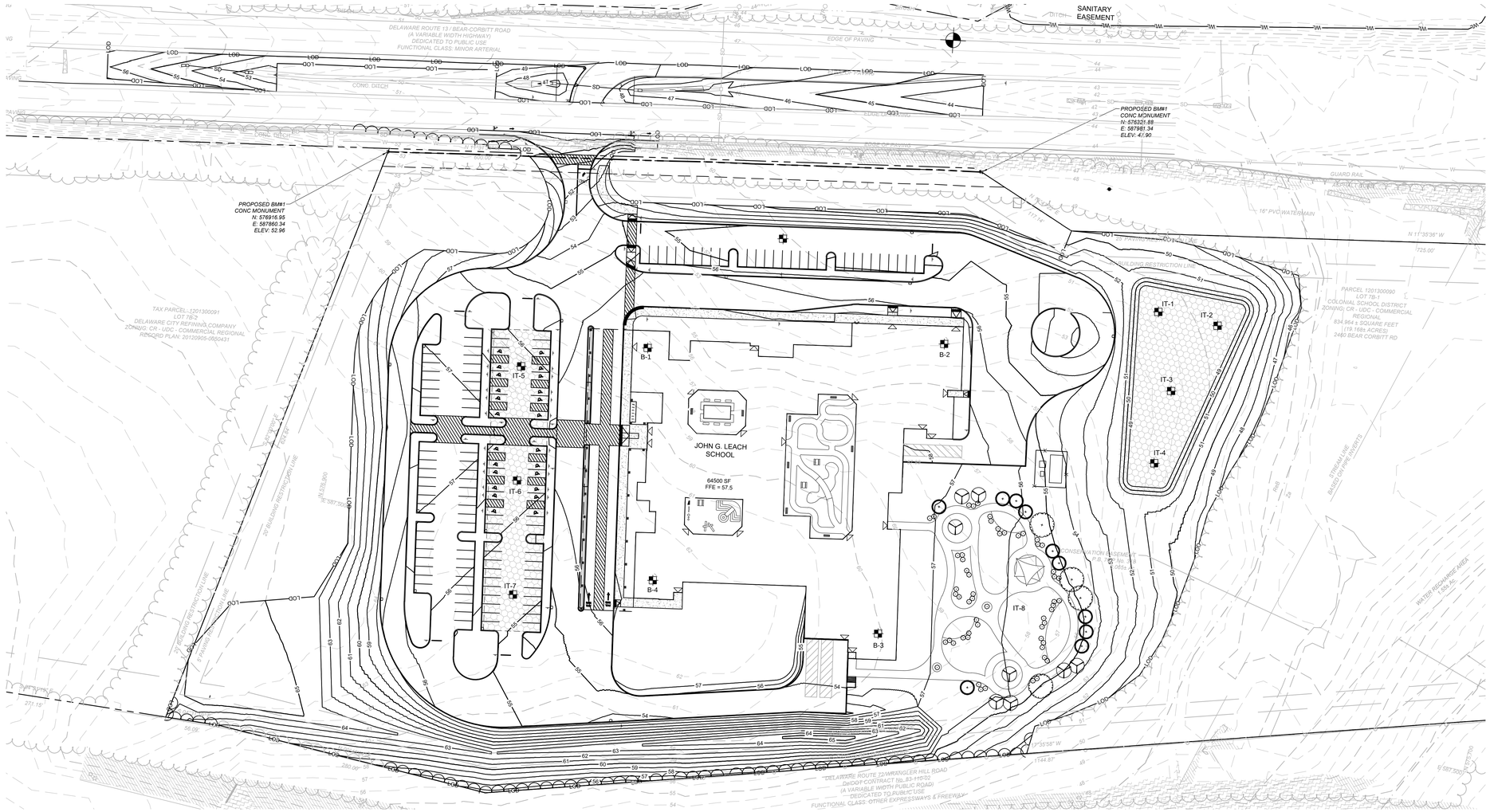
Enclosures: Test Boring Location Plan
Test Boring Logs (4)
General Notes

Test Boring Location Plan



BORING SCHEDULE									
NAME	TYPE	DEPTH	EX GROUND ELEV.	PROP. GROUND ELEV.	TEST ELEV.	NORTHING	EASTING	LATITUDE	LONGITUDE
IT-1	STANDARD AND INFILTRATION-SWM	STD-8FT INF-3.5FT	50.65	49.00	47.00	576,112.6932	587,884.2401	N 39.581569	W 75.658920
IT-2	STANDARD AND INFILTRATION-SWM	STD-8FT INF-2.5FT	49.33	49.00	47.00	576,050.5549	587,884.5739	N 39.581398	W 75.658918
IT-3	STANDARD AND INFILTRATION-SWM	STD-8FT INF-4.5FT	51.39	49.00	47.00	576,081.2295	587,808.5309	N 39.581482	W 75.659188
IT-4	STANDARD AND INFILTRATION-SWM	STD-8FT INF-4.5FT	51.72	49.00	47.00	576,080.8219	587,732.6549	N 39.581480	W 75.659457
IT-5	STANDARD AND INFILTRATION-SWM	STD-20FT INF-15.5FT	60.28	56.23	46.00	576,733.5110	587,678.5492	N 39.583272	W 75.659655
IT-6	STANDARD AND INFILTRATION-SWM	STD-20FT INF-17FT	62.77	56.40	46.00	576,710.3710	587,564.0314	N 39.583207	W 75.660061
IT-7	STANDARD AND INFILTRATION-SWM	STD-20FT INF-17FT	62.79	55.33	46.00	576,687.2311	587,449.5135	N 39.583143	W 75.660467
IT-8	STANDARD AND INFILTRATION-SWM	STD-8FT INF-6FT	58.00	55.62	52.00	576,169.0542	587,547.8192	N 39.581721	W 75.660114

50 0 50 100
SCALE - PLAN: 1" = 50'

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PROJECT

CONSTRUCTION PLANS
COLONIAL SCHOOL DISTRICT
JOHN G. LEACH SCHOOL
2460 BEAR CORBITT RD
NEW CASTLE, DE. 19720

REVISIONS

MARK	DESCRIPTION	DATE

SHEET TITLE

BORING PLAN

EXHIBIT

JULY 31, 2024

DRAWN	CHK'D	PROJECT NO.
JTO	JMS	230004

SHEET NO.

BORE-1

CGC GEOSERVICES

Test Boring Logs
(4)

TEST BORING B-1

Subsurface Evaluation
Proposed John G. Leach School
2460 Bear Corbitt Road
Delaware City, Delaware
CG.4054.GA

Date Started : November 12, 2024
Date Completed : November 12, 2024
Logged by : Z. Holmes
Weather : 50s. sunny
Driller/Agency : J. Truver/CGC Geoservice

Drilling Equipment : CME 55 Track
Drilling Methods : SPT, HSA
Surface Elevation : 58 feet

Sample Condition: ⊠ Remolded
Water Levels: ▽ At completion

Depth in feet	Surf. Elev. 58 ft	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0			ML	Moist, dark brown SILT, little fine sand	⊠	S-1	2-5-7-8	1.3			
	56.0		SM	Dry, brown fine to medium SAND, little gravel, trace to little silt	⊠	S-2	7-9-11-11	1.5			
5				Moist, brown fine to medium SAND, little silt, little clay, trace gravel	⊠	S-3	4-7-9-8	2.0	12.2	18.4	
	52.5		CL	Moist, brown/ red CLAY, little gravel							
	52.0			Moist, brown fine to medium SAND, little silt, trace clay	⊠	S-4	7-8-8-8	1.5			
				Moist, brown fine to medium SAND, little silt, trace clay	⊠	S-5	4-5-5-6	1.8			
10											
15				Moist, brown medium to coarse SAND, little silt	⊠	S-6	4-5-6-6	1.0			
			SM								
20				Moist, brown medium to coarse SAND, little silt	⊠	S-7	4-5-5-6	1.5	18.2	15.7	▽
25				Wet, brown fine to coarse SAND, little silt, little gravel	⊠	S-8	4-4-6-8	1.0			
30				Wet, brown fine to coarse SAND, little silt, little gravel	⊠	S-9	4-5-6-6	1.8			
	27.0										
35											
40											

NOTES:
1. Boring terminated at 31.0 feet below grade.
2. Groundwater observed during drilling at 23.5 feet below grade.
3. Upon completion, boring caved and dry at 12.5 feet below grade. Borehole backfilled with cuttings mixed with bentonite grout.

TEST BORING B-2

Subsurface Evaluation
Proposed John G. Leach School
2460 Bear Corbitt Road
Delaware City, Delaware
CG.4054.GA

Date Started : November 12, 2024
Date Completed : November 12, 2024
Logged by : Z. Holmes
Weather : 50s. sunny
Driller/Agency : J. Truver/CGC Geoservice

Drilling Equipment : CME 55 Track
Drilling Methods : SPT, HSA
Surface Elevation : 53 feet

Sample Condition: ⊠ Remolded
Water Levels: ▽ At completion

Depth in feet	Surf. Elev. 53 ft	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0			ML	Dry, brown SILT and fine sand	⊠	S-1	3-9-7-7	1.0			
	51.0			Moist, brown fine SAND, little silt, little gravel	⊠	S-2	8-7-8-8	1.0	9.8	11.1	
5				Moist, brown fine to medium SAND, little gravel, little silt	⊠	S-3	11-7-7-4	1.5			
				Moist, brown medium SAND, little silt	⊠	S-4	6-7-7-5	1.8			
				Moist, brown medium to coarse SAND, little to some silt	⊠	S-5	6-6-6-8	1.0			
10											
15				Moist, brown medium to coarse SAND, little silt	⊠	S-6	7-6-7-7	1.5	13.6	19.6	
			SM								
20				Wet, brown medium to coarse SAND, little silt	⊠	S-7	6-3-5-5	1.3			▽
25				Wet, brown medium to coarse SAND, little silt	⊠	S-8	3-4-3-4	1.3			
30				Wet, brown medium to coarse SAND, little silt	⊠	S-9	3-3-6-8	1.5			
35				Saturated brown fine to coarse SAND, trace to little silt	⊠	S-10	6-6-6-8	1.5			
	17.0										
40											

NOTES:
1. Boring terminated at 36.0 feet below grade.
2. Groundwater observed during drilling at 21.6 feet below grade.
3. Started mud rotary drilling at 26 feet below grade.
4. Upon completion, boring caved and dry at 13.0 feet below grade. Borehole backfilled with cuttings mixed with bentonite grout.

TEST BORING B-3

Subsurface Evaluation
Proposed John G. Leach School
2460 Bear Corbitt Road
Delaware City, Delaware
CG.4054.GA

Date Started : November 12, 2024
Date Completed : November 12, 2024
Logged by : Z. Holmes
Weather : 50s. sunny
Driller/Agency : J. Truver/CGC Geoservice

Drilling Equipment : CME 55 Track
Drilling Methods : SPT, HSA
Surface Elevation : 60 feet

Sample Condition: ⊠ Remolded

Water Levels

Depth in feet	Surf. Elev. 60 ft	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0			ML	Dry brown SILT, some fine sand, trace organics	⊠	S-1	4-5-5-6	1.0			
	58.0			Dry, brown fine SAND, some silt	⊠	S-2	10-7-11-12	1.3			
			SM								
5				Dry, brown fine SAND, some silt, trace gravel	⊠	S-3	4-6-4-4	1.5			
	54.0		CL	Moist, red / brown CLAY, little fine sand, trace gravel	⊠	S-4	4-5-6-7	1.0	19.9	82.4	
	52.0			Moist, brown medium to coarse SAND, little gravel, trace clay	⊠	S-5	10-11-10-11	1.3			
10											
15			SC	Moist, brown fine to coarse SAND, little clay	⊠	S-6	3-4-6-5	1.5			
20				Moist, brown, medium to coarse SAND, some gravel, little clay	⊠	S-7	5-8-10-10	1.0	17.3	12.7	
25				Moist, brown/ red medium to coarse SAND, some gravel, little clay	⊠	S-8	6-8-9-5	1.8			
	34.0										
30											
35											
40											

NOTES:
1. Boring terminated at 26.0 feet below grade.
2. Groundwater not observed during drilling .
3. Upon completion, boring caved and dry at 10.5 feet below grade. Borehole backfilled with cuttings mixed with bentonite grout.

TEST BORING B-4

Subsurface Evaluation
Proposed John G. Leach School
2460 Bear Corbitt Road
Delaware City, Delaware
CG.4054.GA

Date Started : November 12, 2024
Date Completed : November 12, 2024
Logged by : Z. Holmes
Weather : 50s. sunny
Driller/Agency : J. Truver/CGC Geoservice

Drilling Equipment : CME 55 Track
Drilling Methods : SPT, HSA
Surface Elevation : 62 feet

Sample Condition: ⊠ Remolded

Water Levels

Depth in feet	Surf. Elev. 62 ft	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0			ML	Dry, dark brown SILT, little fine sand	⊠	S-1	4-4-5-6	1.0	9.2	85.3	
	60.0			Moist, dark brown fine SAND, some silt, little gravel	⊠	S-2	5-6-7-9	1.3			
			SM								
5				Moist, brown fine to medium SAND, trace silt	⊠	S-3	3-6-5-5	1.5			
	56.0			Moist, red/brown CLAY, some fine sand, little gravel, trace silt	⊠	S-4	4-4-4-6	1.8			
			CL								
				Moist, brown/ gray CLAY, some fine sand	⊠	S-5	6-6-7-9	2.0	25.3	69.4	
10	52.0										
15				Moist, brown fine to medium SAND, little gravel with lenses of clay	⊠	S-6	4-3-3-5	1.5			
			SC								
20				Moist, brown coarse SAND, some fine gravel, little clay	⊠	S-7	4-5-5-9	1.5			
25				Moist, brown medium to coarse SAND, some gravel, little clay	⊠	S-8	5-8-7-7	1.5			
	36.0										
30											
35											
40											

NOTES:
1. Boring terminated at 26.0 feet below grade.
2. Groundwater not observed during drilling .
3. Upon completion, boring caved and dry at 13.5 feet below grade. Borehole backfilled with cuttings mixed with bentonite grout.

General Notes

GENERAL NOTES

VISUAL UNIFIED CLASSIFICATIONS: The soil samples are described by color, major constituent, modifiers (by percentage), and density (or consistency). Coarse Grained or Granular Soils have more than 50% of their dry weight retained on a No. 200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a No. 200 sieve; they are described as: clays or clayey silts if they are cohesive and silts if they are noncohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density and fine grained soils on the basis of their strength or consistency and their plasticity.

The Unified Soil Classification symbols are:

COARSE GRAINED SOILS

GW - Well graded gravels
GP - Poorly graded gravels
GM - Silty gravels
GC - Clayey gravels
SW - Well graded sands
SP - Poorly graded sands
SM - Silty sands
SC - Clayey sands

FINE GRAINED SOILS

ML - Silts of low plasticity
CL - Clays of low to medium plasticity
OL - Organic silt clays of low plasticity
MH - Silts of high plasticity
CH - Clays of high plasticity
OH - Organic silt clays of high plasticity
PT - Peat and highly organic soils

SIZE DESCRIPTION

F - Fine
M - Medium
C - Coarse
G - Gravel

MODIFIERS (PERCENTAGE)

Tr -	Trace	1 - 10%
Ltl -	Little	11 - 20%
Some		21 - 35%
& -	And	36 - 50%

COLOR

Or - Orange
Yel - Yellow
Br - Brown
Blk - Black
Gr - Gray
R - Red
Vc - Varicolored
Dk - Dark
Lt - Light

DENSITY: COARSE GRAINED SOILS

Very loose	4 blows/ft or less
Loose	5 to 10 blows/ft
Medium	11 to 30 blows/ft
Dense	31 to 50 blows/ft
Very Dense	51 blows/ft or more

CONSISTENCY: FINE GRAINED SOILS

Very soft	2 blows/ft or less
Soft	3 to 4 blows/ft
Medium	5 to 8 blows/ft
Stiff	9 to 15 blows/ft
Very stiff	16 to 30 blows/ft
Hard	31 blows/ft or more

NOTE: The Standard Penetration Test "N" value is the number of blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split spoon sampler, except where otherwise noted.

Preliminary Geotechnical Evaluation
Leach School Concept
2460 Bear Corbitt Road
New Castle, Delaware
Project No. 12644.GA

July 2020

Civil

Water/Natural Resources

Geotechnical

Environmental

Construction Review

Coastal/Waterfront

DUFFIELD ASSOCIATES

Soil, Water & the Environment

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EXECUTIVE SUMMARY

The following report summarizes Duffield Associates, Inc.'s (Duffield's) Preliminary Geotechnical Evaluation for the potential Leach School facility located on the northwest corner of the intersection of Wrangle Hill Road and Bear Corbitt Road in New Castle, Delaware. This report includes information regarding the field and laboratory testing programs, the subsurface conditions encountered, and discussion related to typical building construction, site pavements, and stormwater management facilities as they relate to the subsurface conditions observed at the site. These services were performed in general accordance with Purchase Order No. 508560, dated May 8, 2020.

A new educational facility is proposed with a footprint of approximately 65,000 square feet at the site of an active farm field. No other information regarding the number of floors, finished floor elevations, structural loads, etc. were available at the time of this preliminary evaluation.

On July 9, 2020, thirteen (13) Standard Penetration Test (SPT) borings were performed in general accordance with ASTM D 1586 in the vicinity of the proposed building, pavement, and stormwater management areas to depths ranging between approximately 6 to 30 feet below the existing ground surface. Beneath a surficial layer of silt containing various amounts of organic materials, the subsurface conditions observed can generally be described as a layer of loose to medium dense sands with varying amounts of clay and gravel through the extent of the test borings. In several test borings indications that the natural clayey sand soils directly beneath the surficial silt layer were observed have been 'reworked' likely due to ongoing farming activities. A thin layer of clay was observed in several test borings.

Based on the observed subsurface conditions and information provided by the project team, Duffield provides the following comments and preliminary recommendations:

- The proposed buildings could be supported on a conventional shallow foundation system and slab-on-grade. Foundations could be designed for a maximum allowable bearing pressure of 3,000 pounds per square foot (psf).
- Groundwater was observed in one of the test borings performed at the site at a depth of approximately 27.8 feet below the existing ground surface which corresponds to an approximate elevation at 33 feet (NAVD 88). Based on the groundwater depth observed during the field program and regional groundwater mapping, groundwater should not be encountered during foundation construction.
- Test borings for storm water facilities were performed in potential storm water management areas throughout the site. Based on the subsurface conditions encountered, infiltration is generally considered practical within the sandy soils, however the potential presence of a thin clay layer should be evaluated once the stormwater management locations and elevations are determined by others.

This report is considered "preliminary" in nature as a formal design process has not commenced. As such, this report and all assumptions and recommendations made herein should be reviewed and possibility modified by Duffield during the design process.

PROJECT SUMMARY

PROPOSED SITE CONSTRUCTION

- A new educational facility is proposed with a footprint of approximately 65,000 square feet. No other information regarding the number of floors, finished floor elevations, structural loads, etc. were available at the time of this preliminary evaluation.
- It is assumed that the proposed school will also include required parking and stormwater management systems to be designed in the future.

REFERENCE UTILIZED

- A sketch titled, "Concept Plan George Leach School," prepared by Duffield Associates Inc. dated May 29, 2020, which indicates a conceptual layout of the proposed campus, as well as requested test boring locations at the site.

EXISTING SITE CONDITIONS

- The site of the proposed development is an active farm field with historical aerial photos confirming agricultural activities dating back to at least 1926.
- The approximate 19-acre site is wooded around the perimeter with additional farmland to the north, Bear Corbitt Road (DE SR 7) to the east, Wrangle Hill Road (DE SR 72) to the south, and DE SR 1 to the west.
- A small-unnamed tributary to Dragon Creek is mapped within the wooded area along Wrangle Hill Road at the southern end of the site.
- The site is sloping gently downward in the southeast direction between approximately elevations 63 to 51 feet (NAVD 88).
- No existing utilities were observed or delineated within the proposed development area.

FIELD AND LABORATORY TESTING

STANDARD PENETRATION TEST BORINGS

- On July 9, 2020, thirteen (13) Standard Penetration Test (SPT) borings were performed in general accordance with ASTM D 1586 in the vicinity of the proposed building, parking area, and stormwater management areas indicated on the enclosed boring location sketch. The test borings were performed at the following locations:
    - Five (5) SPT borings, designated TB-1 to TB-5, performed within the preliminary building area to depths ranging of approximately 25 to 30 feet below the existing grades;
    - Four (4) SPT borings, designated TB-6 to TB-9, performed in proposed pavement areas to depth up to 12 feet below existing grades;
    - Four (4) SPT borings, designated TB-10 and TB-13, performed in proposed stormwater management areas to depths of approximately 6 feet below the existing grade.
- The test borings were performed by CGC Geoservices, LLC, an affiliate company of Duffield, utilizing a truck-mounted CME 75 drill rig with hollow-stem augers in areas accessible to the drill rig and clear of utilities.
- The approximate test boring locations are indicated on the enclosed test boring location sketch. Test boring logs, which describe the conditions observed during the field program are enclosed.

LABORATORY TESTING

Following the test boring program, the samples were returned to Duffield's office. Results of the laboratory testing are included on the enclosed test boring logs and summarized in the following table. Laboratory testing program for this evaluation included determination of natural water content, percentage finer than 200 sieve, and Atterberg limit tests on selected samples. No environmental testing or characterization was performed.

LOCATION	SAMPLE NO.	DEPTH (FEET)	MOISTURE CONTENT (%) (ASTM D2216)	PERCENT PASSING NO. 200 SIEVE (%) (ASTM D 1140)	LIQUID LIMIT/PLASTIC LIMIT (ASTM D4318)
TB-1	S-5	8.0 – 10.0	7.7 %	14.7 %	--
TB-2	S-8	23.0 – 25.0	8.7 %	11.1 %	--
TB-3	S-4	6.0 – 8.0	18.6 %	79.0 %	LL - 36 / PL - 18
TB-4	S6-B	14.0 – 15.0	25.0 %	82.5 %	LL - 40 / PL - 21
TB-5	S-4	6.0 – 8.0	14.3 %	31.6 %	--
TB-10	S-3	4.0 – 6.0	6.4 %	18.1 %	--
TB-13	S-3	4.0 – 6.0	11.5 %	35.2 %	--

SUBSURFACE CONDITIONS

GENERALIZED SITE GEOLOGY

Based on available Delaware Geologic Survey (DGS) mapping, the project site is located in the Atlantic Coastal Plain Physiographic Province. The primary surficial unit consists of the Columbia Formation, which is characterized by cross-bedded, yellowish to reddish-brown, fine to coarse feldspathic quartz sand with varying amounts of gravel. Beds of tan to reddish-gray clayey silt are sometimes encountered within the formation. The origin of this formation is of the fluvial glacial outwash sediment. The coastal plain sediments, typically covering the crystalline basement complex, is reported to be on the order of 850 feet deep.

STRATIGRAPHIC CONDITIONS

Beneath a surficial layer of silt containing some organics, the subsurface conditions observed can generally be described as natural soils consisting of loose to medium dense sands with variable amounts of clay. In several borings, the clayey sand soils directly beneath the surficial silts appear to be natural site soils that have been 'reworked' likely due to the sites utilization as a farm field. A relatively thin layer of clay (i.e., approximately 6 to 18 inches where encountered) was observed within the clayey sand stratum. The clayey sand soils were observed to be underlain by loose to dense sands with various amounts of clay and gravel to the extent of the test borings.

For discussion purposes, the subsurface conditions can be further described as follows:

SUBSURFACE STRATUM	APPROXIMATE STRATUM THICKNESS (FEET)	GENERALIZED DESCRIPTION[1]
A	0.5 – 2.0	Brown SILT, trace to little fine sand, organics, (tilled farm soils) USCS: ML
B	2.0 – ---[2]	Brown, light brown, orange fine SAND, little clay, trace to little medium sand, trace gravel (loose to medium density); apparent reworked site soils observed in several borings. USCS: SC
C	0.5 - ---[3]	Red, brown, gray CLAY, trace to little fine sand (moist, medium stiff consistency); USCS: CL
D	---[4]	Light brown, orange fine to medium SAND, trace clay, trace coarse sand, trace gravel (moist, loose to medium density); USCS: SW
Notes:	1. The soil descriptions utilized herein and on the test boring logs are defined in the attached General Notes. 2. Stratum B not fully penetrated in test borings TB-8, TB-10, TB-11, TB-12 and TB-13. 3. Stratum C only observed in test borings TB-3, TB-4, and TB-9. Not fully penetrated in test boring TB-9. 4. Stratum D not fully penetrated in any of the test borings and not encountered in test borings TB-10, TB-11, TB-12 and TB-13.	

GROUNDWATER

- Apparent groundwater was only observed in the test boring TB-2 performed at the site to a depth of approximately 27.8 feet below the existing ground surface corresponding to an elevation of approximately 33.2 (NAVD 88).
- Groundwater mapping by the Delaware Geological Survey indicate average groundwater levels to be greater than 20 feet below the existing ground surface.
- The test borings performed at the site were completed during a seasonally "dry" period. It is noted that the water elevations observed during the performance of the test borings are generally consistent with those indicated in DGS mapping.
- Groundwater levels are likely to be affected by season and annual variations in precipitation. It is estimated that variations in groundwater levels several feet higher or lower than those observed in this elevation could be experienced during extreme variations in precipitation.

DISCUSSION OF ANALYSIS

SITE PREPARATION

Due to the site's use as an agricultural field for almost a century, disturbance and reworking of the first several feet (or more) of the site soils should be anticipated. Soils containing organics are not considered suitable for support of foundations, slab-on-grade, or pavements and should be removed and replaced with structural fill, as described further herein, if encountered during site preparations.

SITE REGRADING CONSIDERATIONS

It is likely that bulk site regrading will be required to achieve the final design elevations. Once the proposed site grades are established, Duffield should be consulted in order to provide site specified recommendations.

SHALLOW FOUNDATION SLAB-ON-GRADE SYSTEM

Although no project specific structural or architectural information was available at the time of this preliminary report, it is Duffield's opinion that the natural site soils consisting of medium dense or greater clayey sands (Stratum B) or medium dense or greater sands (Stratum D) encountered in the test borings, are generally suitable for supporting a typical school building on a shallow foundation and slab-on-grade system. Structural fill, placed and compacted as recommended herein is also considered suitable for support of proposed structures.

PAVEMENT AREAS

At the time of this report, proposed grading for the site pavements was not provided. Strata containing a significant portion of fine-grained soils and organics, such as those described in this report as Stratum A, are generally not considered suitable for pavement subgrade. Strata consisting of predominantly granular sand soils (Stratum B or structural fill), are considered well-draining subgrade soils. The predominately shallow coarse-grained clayey sand soils observed during the performance of the test borings generally corresponds to the American Association of State Highway and Transportation Officials (AASHTO) classification A-2, which are considered "excellent to good" subgrade soils. The predominately clay soils of Stratum C generally correspond to AASHTO classification A-6, which are considered "fair to poor" subgrade soils. "Excellent to good" soils are considered better draining and less frost susceptible materials than the fine-grained "fair to poor" subgrade materials.

PRELIMINARY DESIGN RECOMMENDATIONS

1. ALLOWABLE FOUNDATION BEARING CAPACITY AND SETTLEMENT

- It is Duffield's opinion that the natural clayey sand soils (Stratum B) encountered below the surficial silt layer (Stratum A) and sandy soils of Stratum D are generally considered suitable for supporting the proposed building on shallow spread footing foundation and slab-on-grade systems following subgrade preparation and review, as discussed further herein. Structural fill, placed, compacted and reviewed, as recommended in this report, is also considered suitable for supporting shallow foundations.
- It is recommended that the proposed foundations for the building be designed for a maximum net allowable bearing pressure of 3,000 pounds per square foot.
- Maximum total foundation settlement for the building can be provided once the proposed site grading, structural loads, etc. are available.

2. FOUNDATION BURIAL DEPTH AND SIZE

- Foundations in areas exposed to frost should be placed at least 32 inches below final exterior grade;
- Interior foundations in insulated areas should be placed at least 18 inches below the proposed finished floor elevation;
- All continuous wall footings should be at least 2-feet wide, and all isolated column footings should be at least 3-feet wide, regardless of bearing pressure; and
- If a winter construction schedule is proposed for the foundations, provisions for the protection of shallow foundations from frost heave during construction should be included in the contract specifications.

3. SLAB-ON-GRADE

- Ground-supported floor slabs should be designed as free floating and should not be connected to the other structural elements (e.g., walls, framing, etc.) of the buildings. Isolation joints should be utilized at the interface of proposed ground-supported floor slabs and structural elements to accommodate potential differential settlement.
- A minimum 10 mil polyethylene vapor barrier and free-draining subbase, consisting of at least 4 inches of poorly graded crushed stone aggregate, such as AASHTO SP-57 stone, should be provided beneath floor slabs.
- Subgrade conditions should be modeled for design utilizing a subgrade modulus, K_S of 150 pci, provided subgrade preparation is performed as recommended in this report.

4. SEISMIC DESIGN PARAMETERS

Based on the subsurface conditions encountered during the field exploration at the site and the review of regional geologic maps, a "D" site classification is recommended for the analysis of seismic conditions, as defined by 1613.2.2 of the 2018 International Building Code and Chapter 20 of the American Society of Civil Engineers Minimum Design Loads for Buildings and Other Structures (ASCE/SEI 7-16).

5. CONTROL JOINTS

Masonry walls (if applicable) should be provided with frequent control joints placed at architecturally convenient locations (e.g., windows and doorways) to provide a "preferred" location for differential settlement to occur to reduce the potential for cracking of the walls.

6. STORMWATER MANAGEMENT AREA DESIGN

- While in-situ infiltration testing was not performed during this preliminary evaluation, the types and consistency of the soils encountered during the performance of the field evaluation indicate that infiltration of stormwater run off may be practical at the site. Depending on the location and elevation of the proposed stormwater management systems, the subsurface conditions for at least several feet below the systems should be evaluated for hydraulically restrictive layers such as Stratum C clays. In-situ testing will be required once the size and elevations of proposed SWM systems is determined.
- No indications of the seasonal high water table (SHWT) were observed during the performance of the test borings. Groundwater levels observed were at a significant depths, on the order of 28 feet below the existing ground surface.

7. SITE GRADING

Site grading should be designed to provide positive drainage away from the proposed construction areas. Positive site drainage should be maintained throughout the construction activities. Final site grading should provide drainage aware from all structures.

8. ASSUMPTIONS

This report is considered "preliminary" in nature as a formal design process has not commenced. As such, this report and all assumptions and recommendations made herein should be reviewed and possibility modified by Duffield Associates during the design process. Depending on the details (i.e., elevations, structural loads, locations, etc.) provided during the design process for the buildings, parking and stormwater management, it is possible that additional subsurface evaluation may be recommended.

CONSTRUCTION RECOMMENDATIONS

1. PROOFROLLING AND SUBGRADE PREPARATION

- At the start of construction, the site should be stripped of all topsoil and vegetation. Following rough grading and prior to footing excavation, placement of fill, or construction of floor slabs, it is recommended that the exposed subgrade in the building area be proofrolled. The proofrolling should be performed using a minimum of two passes of a 10-ton static roller or a fully-loaded tandem dump truck in the presence of a qualified soils technician working under the supervision of a geotechnical engineer. The purpose of the proofrolling is to identify yielding subgrade conditions. The proposed construction area should be proofrolled at least 10 feet beyond the building perimeters.
- Yielding subgrade conditions encountered within the proposed building areas should be undercut to firm, subgrade conditions, and backfilled with compacted structural fill placed in accordance with the recommendations of this report. If acceptable to the project's engineer, granular soils may also be densified in place. The subgrade review should confirm the consistency and texture of the exposed soils with the conditions encountered by this evaluation, as described herein.

2. FOUNDATION SUBGRADE REVIEW

- All shallow foundations should be placed on firm, dry, non-frozen subgrade consisting of medium density sands (Strata B or D) or on structural fill, placed and compacted as recommended herein. Foundation excavations should be reviewed by a qualified technician working under the supervision of a geotechnical engineer who is familiar with the recommendations of this report.
- If soft/loose or unsuitable subgrade conditions area encountered at the proposed building area depths, additional excavation should be performed until they are uniformly encountered across the base of the foundation's excavation or, if acceptable to the project geotechnical engineer, the natural sand soils can be densified in place. Foundation undercut areas should be backfilled with structural fill as recommended herein.

3. RE-USE OF ON-SITE SOILS AS STRUCTURAL FILL

- On-site soils free of organic material, topsoil, miscellaneous fill, debris, and rock fragments in excess of 3 inches in their largest dimension may be suitable as structural fill.
- The surficial soils containing organics (Stratum A) are not considered suitable for reuse as structural fill. It is recommended that these soils be utilized were possible in landscaped areas.
- Since the proposed site regrading is unknown, it is possible that on-site materials that will be available as fill from the excavations will consist of the Stratum B sand, Stratum C clays and/or Stratum D sands. These soils, free of organics and debris are considered suitable for backfill, as long as the moisture content of the soils is within

the range in which the specified compaction requirements can be achieved. The sandy soils observed in the test borings were generally observed to have moisture contents at which typical compaction requirements can be achieved, however the clay soils were at a moisture content that may require some drying prior to reuse. As a result, it should be anticipated that a significant amount of aeration and drying will likely be necessary. Drying of the fine-grained surface soils will only be feasible during the warm, dry season of the year and may require extended drying times and discing effort to adequately dry the soils to a moisture content that is acceptable for compaction.

- If sufficient quantities of suitable on-site soils are not available for structural fill, imported borrow consisting of predominately granular soils conforming to the requirements of DelDOT Standard Specifications Borrow Type C (Backfill) should be utilized. AASHTO SP-57 stone could also be utilized as structural fill at locations, as recommended by the project engineer, and should be considered for localized, relatively deep fills such as foundation undercuts.

4. COMPACTION REQUIREMENTS

- Structural fill should be placed in loose lifts with a maximum thickness of 8 inches.
- Each lift of fill placed within the proposed building construction areas (defined as the area extending at least 5 feet beyond the foundation element perimeters) should be compacted to at least 95% of the maximum dry density, as determined by the Modified Proctor test (ASTM D 1557).
- Structural fill for site pavements and for utility trenches located outside of the proposed building construction areas should be compacted to at least 90% of the Modified Proctor maximum dry density.
- Structural fill placed in proposed landscaped areas should be compacted to at least 85% of the maximum dry density, as determined by the Modified Proctor test.
- The placement and compaction of structural fill should be monitored on a full-time basis by a qualified technician working under the supervision of a geotechnical engineer.

5. EXCAVATION SAFETY

All utility and foundation excavation should be performed in accordance with OSHA guidelines. Typically granular soils observed in clayey sands can be characterized by OSHA CFR Part 1926 Excavation Standards as Type C soils. Should it be required, all temporary sheeting, shoring, benching, and sloping should be designed by a qualified engineer registered in the State of Delaware.

6. PROTECTION OF SUBGRADE SOILS

The site soils are considered moisture sensitive. Exposure of these soils to precipitation and construction traffic may weaken the soils and result in yielding subgrade conditions. In addition, if foundation excavations are left open, precipitation may result in the collection of water within the excavation. Provisions for removal of water by drainage or sumping are recommended. Subgrade soils disturbed by precipitation and construction traffic

should be either scarified and re-compacted, or undercut and replaced with structural fill as previously recommended in this report.

7. GROUNDWATER CONTROL

Groundwater was generally observed at a depth of approximately 27.8 feet below the existing ground surface, corresponding to elevations ranging from approximately 33 feet (NAVD 88) in the test borings performed during this evaluation. Based on the subsurface conditions encountered, regional groundwater conditions will likely be below the depth of typical shallow foundations depending on the final design elevations. If perched groundwater is encountered during excavation for foundations or utilities, localized sumping may be required. Wherever significant quantities of stormwater or groundwater are encountered during excavation, it may become necessary for the resulting excavation to be over-excavated by a minimum of 6 inches and backfilled with AASHTO SP-57 stone to facilitate sumping and protect the exposed subgrade during construction.

8. SUBSURFACE DATA

All contractors interested in bidding on phases of this work, which involve subsurface conditions, should be given full access to this report so that they can develop their own interpretations of the available data.

9. CONSTRUCTION REVIEW

It is recommended that the project budget include provisions for the cost for independent construction monitoring of the earthwork and foundation construction by a qualified engineering firm retained by the Owner, to review conformance of construction with the recommendations of the project geotechnical evaluation, as well as the project plans and specifications.

QUALIFICATIONS

The preliminary recommendations of this report have been prepared according to generally accepted soil and foundation engineering practice, and are based on the conditions encountered by the test borings performed at the site. Although soil quality has been inferred from the interpolation of the sampling data, you should explicitly note that subsurface conditions beyond the test borings are, in fact, unknown. Should any conditions encountered during construction differ from those described in this report, this office should be notified immediately in order to review, and possibly modify these recommendations. This report applies solely to the size, type, and location of the structures described herein. This report will not be considered valid unless design drawings have been reviewed and the recommendations of this report modified and re-approved in writing by Duffield Associates, Inc.

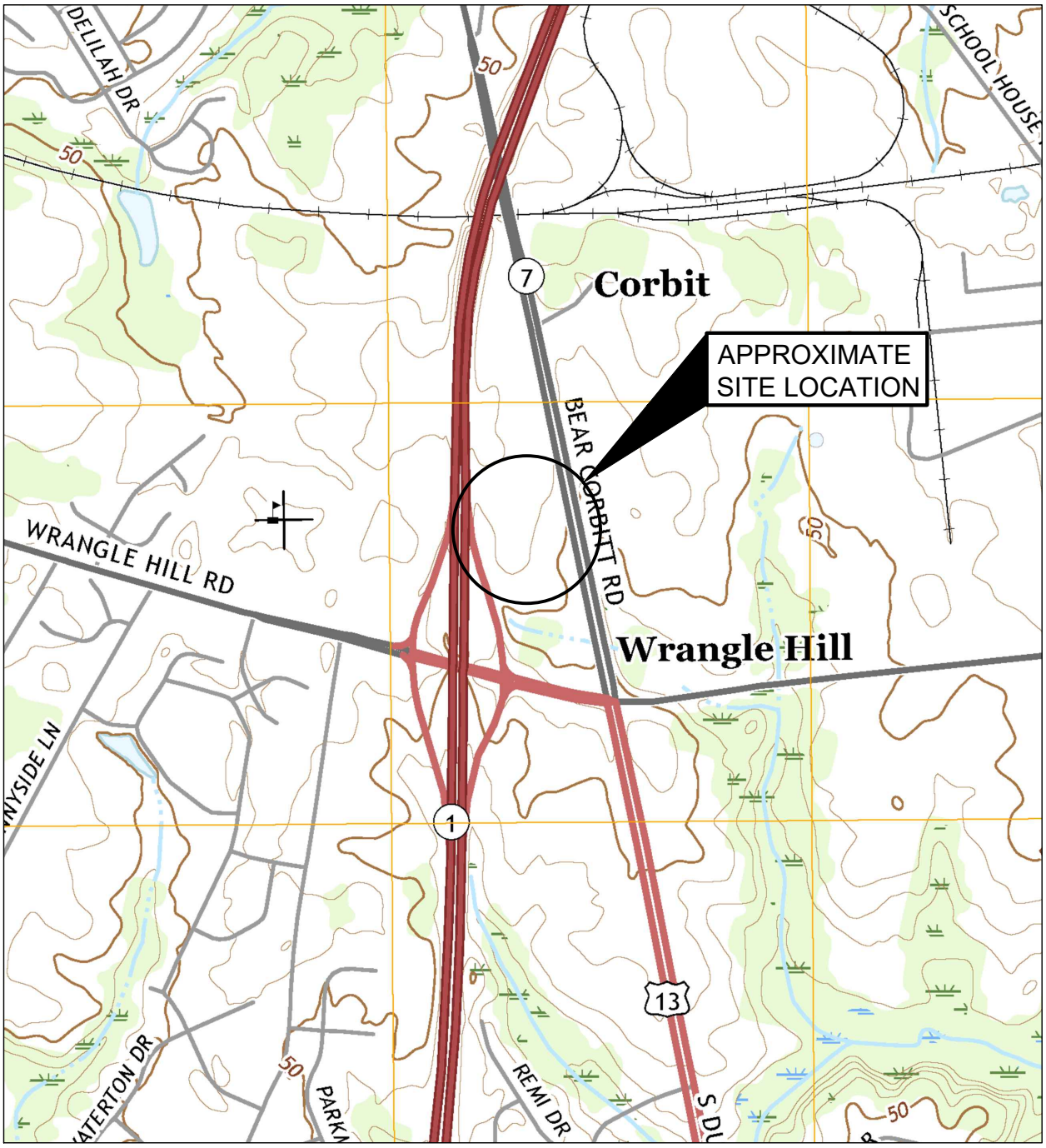
ENCLOSURES

SITE LOCATION SKETCH

TEST BORING LOCATION SKETCH

TEST BORING LOGS (13)

GENERAL NOTES



NOTE:

THIS SKETCH IS ADAPTED FROM 7.5 MINUTE SERIES U.S.G.S TOPOGRAPHIC MAPS TITLED "SAINT GEORGES, DE" , DATED 2016.

DATE: 24 JULY 2020	SITE LOCATION SKETCH	**DESIGNED BY:** JLR	DUFFIELD ASSOCIATES Soil, Water & the Environment
SCALE: 1" = 1250'		**DRAWN BY:** JLR	5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. 302.239.6634 FAX 302.239.8485
PROJECT. NO. 12644.GA	**GEORGE LEACH SCHOOL**	**CHECKED BY:** MBV	OFFICES IN DELAWARE, MARYLAND PENNSYLVANIA AND NEW JERSEY
SHEET: FIGURE_1	**2460 BEAR CORBITT ROAD**	**FILE:** A-12644GA-01	E-MAIL: DUFFIELD@DUFFNET.COM
	RED LION HUNDRED ~ NEW CASTLE COUNTY ~ DELAWARE		

KEY:

TB-1 - APPROXIMATE TEST BORING LOCATION

NOTE:
THIS SKETCH IS ADAPTED FROM A DRAWING TITLED "CONCEPT PLAN, GEORGE LEACH SCHOOL" PREPARED BY DUFFIELD ASSOCIATES, INC., DATED MAY 29, 2020.

DATE: 24 JULY 2020	TEST BORING LOCATION SKETCH	**DESIGNED BY:** JLR	DUFFIELD ASSOCIATES Soil, Water & the Environment
SCALE: 1" = 100'		**DRAWN BY:** JLR	
PROJECT. NO. 12644.GA	**GEORGE LEACH SCHOOL** **2460 BEAR CORBITT ROAD**	**CHECKED BY:** MBV	5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. 302.239.6634 FAX 302.239.8485
SHEET: FIGURE 2	**RED LION HUNDRED~NEW CASTLE COUNTY~DELAWARE**	**FILE:** A-12400GZ-02	OFFICES IN DELAWARE, MARYLAND PENNSYLVANIA AND NEW JERSEY E-MAIL: DUFFIELD@DUFFNET.COM

DUFFIELD ASSOCIATES
Soil, Water & the Environment

TEST BORING TB-01

Preliminary Geotechnical Evaluation
Colonial School District
Proposed Leach School
New Castle, Delaware
Project No. 12644.GA

Date Started : July 9, 2020
Date Completed : July 9, 2020
Logged by : CTM
Weather : Partly Cloudy, 80s
Driller/Agency : J. Blemming/CGC Geoservices, LLC

Drilling Equipment : Truck Mounted CME - 75
Drilling Methods : HSA (SPT, ASTM D 1586)
Surface Elevation : 60 feet NAVD88

Sample Condition: ☒ Remolded
Water Levels

Depth in feet	Surf. Elev. 60 ft	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0			ML	Brown SILT, trace to little fine sand, trace organics (roots) (moist)		S-1	2-2-3-3	1.6			
	58.0			Brown fine SAND, trace to little clay, trace gravel (possible reworked site soils) (moist)		S-2	4-4-5-7	1.4			
5						S-3	4-6-7-6	1.0			
				No Recovery		S-4	3-3-5-7	0.0			
				Brown, orange fine to medium SAND, little clay, trace gravel (moist)		S-5	5-6-7-6	1.8	7.7	14.7	
10			SC								
				Light brown, orange fine SAND, little clay (moist)		S-6	3-4-2-4	1.2			
15											
	42.0			Light brown, orange fine to medium SAND, trace clay, trace gravel, trace coarse sand (moist)		S-7	3-5-5-6	1.6			
20			SW								
				Light brown, red fine to medium SAND, trace to little clay, trace gravel, trace coarse sand (moist)		S-8	3-8-10-11	1.2			
25	35.0			Test Boring Terminated at Approximately 25 feet							
30											

NOTES:
1. Test boring terminated at ± 25 feet below existing ground surface (b.e.g.s).
2. Groundwater not observed during performance of the test boring.
3. Boring backfilled with soil cuttings upon completion.
4. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

DUFFIELD ASSOCIATES
Soil, Water & the Environment

TEST BORING TB-02

Preliminary Geotechnical Evaluation
Colonial School District
Proposed Leach School
New Castle, Delaware
Project No. 12644.GA

Date Started	: July 9, 2020	Drilling Equipment	: Truck Mounted CME - 75
Date Completed	: July 9, 2020	Drilling Methods	: HSA (SPT, ASTM D 1586)
Logged by	: CTM	Surface Elevation	: 61 feet NAVD88
Weather	: Partly Cloudy, 80s		
Driller/Agency	: J. Blemming/CGC Geoservices, LLC		

Sample Condition: ⊠ Remolded
Water Levels: ▼ During Drilling; ▽ After Completion

Depth in feet	Surf. Elev. 61 ft	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0			ML	Brown SILT, trace to little fine sand, trace organics (roots) (moist)	⊠	S-1	2-3-4-6	1.4			
	59.0										
				Brown fine SAND, trace to little clay, trace gravel (possible reworked site soils) (moist)	⊠	S-2	7-9-7-7	1.2			
5			SC	Brown, orange fine SAND, little clay, trace gravel (moist)	⊠	S-3	4-5-6-6	1.3			
				Brown, gray, red, fine SAND, little clay (moist)	⊠	S-4	4-4-4-4	1.8			
	53.0										
				Light brown fine to medium SAND, trace clay (moist)	⊠	S-5	2-5-6-6	1.0			
10											
				Light brown, orange fine SAND, trace clay (moist)	⊠	S-6	2-4-4-5	1.2			
15											
			SW	Light brown, orange fine to medium SAND, trace clay, trace gravel (moist)	⊠	S-7	4-7-9-8	1.2			
20											
				Light brown, orange fine to medium SAND, trace clay, trace gravel (moist)	⊠	S-8	4-5-5-7	1.0	8.7	11.1	
25											▽
				Brown fine to medium SAND, little clay, trace gravel, trace coarse sand (wet)	⊠	S-9	4-6-6-6	1.4			▼
30	31.0			Test Boring Terminated at Approximately 30 feet							

NOTES:
1. Test boring terminated at ± 30 feet below existing ground surface (b.e.g.s).
2. Wet on spoon condition observed at ± 28.5 b.e.g.s.
3. Water level upon completion was observed at ± 27.8 b.e.g.s with augers at ± 28 b.e.g.s.
4. Boring backfilled with soil cuttings upon completion.
5. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

DUFFIELD ASSOCIATES
Soil, Water & the Environment

TEST BORING TB-03

Preliminary Geotechnical Evaluation
Colonial School District
Proposed Leach School
New Castle, Delaware
Project No. 12644.GA

Date Started	: July 9, 2020	Drilling Equipment	: Truck Mounted CME - 75
Date Completed	: July 9, 2020	Drilling Methods	: HSA (SPT, ASTM D 1586)
Logged by	: CTM	Surface Elevation	: 62 feet NAVD88
Weather	: Partly Cloudy, 80s		
Driller/Agency	: J. Blemming/CGC Geoservices, LLC		

Sample Condition: ⊠ Remolded
Water Levels

Depth in feet	Surf. Elev. 62 ft	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0			ML	Brown SILT, trace fine sand, trace organics (roots) (moist)	⊠	S-1	1-3-4-3	1.0			
	60.0										
			SC	Brown fine SAND, trace to little clay, (possible reworked site soils) (moist)	⊠	S-2	3-2-2-4	1.6			
5				Light brown, orange fine SAND, trace clay (moist)	⊠	S-3	6-8-7-6	1.8			
	55.5		CL	Brown, gray, red CLAY, some fine sand (moist)	⊠	S-4	3-4-4-4	1.6	18.6	79.0	
	54.0										
			SC	Brown fine to medium SAND, trace to little clay, trace gravel (moist)	⊠	S-5	4-5-7-7	1.7			
10											
				Brown, orange, red fine SAND, little to some clay (moist)	⊠	S-6	3-3-4-5	1.6			
15	47.0										
			SW	Orange, light brown fine to medium SAND, trace to little clay, trace gravel, trace coarse sand (moist)	⊠	S-7	7-7-8-11	1.4			
20											
				Light brown, red fine to medium SAND, trace clay, trace gravel, trace coarse sand (moist)	⊠	S-8	5-8-8-8	1.0			
25	37.0			Test Boring Terminated at Approximately 25 feet							
30											

NOTES:
1. Test boring terminated at ± 25 feet below existing ground surface (b.e.g.s).
2. Groundwater not observed during performance of the test boring.
3. Boring backfilled with soil cuttings upon completion.
4. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

DUFFIELD ASSOCIATES
Soil, Water & the Environment

TEST BORING TB-04

Preliminary Geotechnical Evaluation
Colonial School District
Proposed Leach School
New Castle, Delaware
Project No. 12644.GA

Date Started	: July 9, 2020	Drilling Equipment	: Truck Mounted CME - 75
Date Completed	: July 9, 2020	Drilling Methods	: HSA (SPT, ASTM D 1586)
Logged by	: CTM	Surface Elevation	: 59 feet NAVD88
Weather	: Partly Cloudy, 80s		
Driller/Agency	: J. Blemming/CGC Geoservices, LLC		

Sample Condition: ⊠ Remolded
Water Levels

Depth in feet	Surf. Elev. 59 ft	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0			ML	Brown SILT, trace to little fine sand, trace organics (roots) (moist)		S-1	2-3-3-3	1.7			
	57.0			Brown, orange fine SAND, trace to little clay (moist)		S-2	4-4-7-9	1.8			
5				Orange, brown fine to medium SAND, trace to little clay, trace gravel (moist)		S-3	6-9-8-8	1.0			
				No recovery		S-4	11-10-10-10	0.0			
			SC	Brown, orange fine to medium SAND, trace clay, trace gravel (moist)		S-5	9-7-6-6	1.8			
10											
				Brown, orange fine to medium SAND, trace clay (moist)		S-6A	8-4-3-7	2.0	25.0	82.5	
	45.0		CL	Red CLAY, little fine sand (moist)		S-6B					
15	44.0										
				Light brown, orange fine to medium SAND, trace clay, trace gravel, trace coarse sand (moist)		S-7	11-7-7-9	1.2			
20			SW								
				Light brown fine to medium SAND, trace clay (moist)		S-8	11-8-8-9	1.0			
25	34.0			Test Boring Terminated at Approximately 25 feet							
30											

NOTES:
1. Test boring terminated at ± 25 feet below existing ground surface (b.e.g.s).
2. Groundwater not observed during performance of the test boring.
3. Boring backfilled with soil cuttings upon completion.
4. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

DUFFIELD ASSOCIATES
Soil, Water & the Environment

TEST BORING TB-05

Preliminary Geotechnical Evaluation
Colonial School District
Proposed Leach School
New Castle, Delaware
Project No. 12644.GA

Date Started	: July 9, 2020	Drilling Equipment	: Truck Mounted CME - 75
Date Completed	: July 9, 2020	Drilling Methods	: HSA (SPT, ASTM D 1586)
Logged by	: CTM	Surface Elevation	: 62 feet NAVD88
Weather	: Partly Cloudy, 80s		
Driller/Agency	: J. Blemming/CGC Geoservices, LLC		

Sample Condition: ☒ Remolded
Water Levels

Depth in feet	Surf. Elev. 62 ft	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0			ML	Brown SILT, trace fine sand, trace organics (roots) (moist)	☒	S-1	2-3-5-7	1.0			
	60.0			Brown, orange fine SAND, trace to little clay, (possible reworked site soils) (moist)	☒	S-2	8-8-11-13	1.4			
5			SC	Brown, orange fine SAND, trace clay (moist)	☒	S-3	8-8-6-9	1.2			
				Brown, red fine SAND, some clay (moist)	☒	S-4	10-5-7-7	1.4	14.3	31.6	
	54.0			Brown fine to medium SAND, trace clay, trace coarse sand (moist)	☒	S-5	7-3-5-6	1.2			
10											
				Light brown, orange fine SAND, trace clay (moist)	☒	S-6	7-7-6-7	1.4			
15			SW								
				Brown, orange, red fine to medium SAND, trace to little clay, trace coarse sand (moist)	☒	S-7	6-4-4-6	1.5			
20											
				Brown, orange, red fine to medium SAND, trace to little clay, trace gravel, trace coarse sand (moist)	☒	S-8	6-9-6-7	1.0			
25	37.0			Test Boring Terminated at Approximately 25 feet							
30											

NOTES:
1. Test boring terminated at ± 25 feet below existing ground surface (b.e.g.s).
2. Groundwater not observed during performance of the test boring.
3. Boring backfilled with soil cuttings upon completion.
4. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

DUFFIELD ASSOCIATES
Soil, Water & the Environment

TEST BORING TB-06

Preliminary Geotechnical Evaluation
Colonial School District
Proposed Leach School
New Castle, Delaware
Project No. 12644.GA

Date Started	: July 9, 2020	Drilling Equipment	: Truck Mounted CME - 75
Date Completed	: July 9, 2020	Drilling Methods	: HSA (SPT, ASTM D 1586)
Logged by	: CTM	Surface Elevation	: 54 feet NAVD88
Weather	: Partly Cloudy, 80s		
Driller/Agency	: J. Blemming/CGC Geoservices, LLC		

Sample Condition: ☒ Remolded
Water Levels

Depth in feet	Surf. Elev. 54 ft	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0			ML	Brown SILT, little to some fine sand, trace organics (roots) (moist)		S-1	6-7-9-8	1.8			
	52.0		SC	Brown fine SAND, little clay, trace gravel, trace coarse sand (moist)		S-2	9-5-4-7	0.8			
	50.0										
5				No recovery		S-3	6-6-5-8	0.0			
			SW	Brown, orange fine SAND, trace clay, trace gravel (moist)		S-4	8-6-7-10	0.4			
				Brown fine to medium SAND, trace clay, trace coarse sand (moist)		S-5	6-8-9-8	0.4			
10				Orange, brown fine to medium SAND, trace to little clay (moist)		S-6	8-4-5-4	1.6			
	42.0			Test Boring Terminated at Approximately 12 feet							
15											
20											
25											
30											

NOTES:
1. Test boring terminated at ± 12 feet below existing ground surface (b.e.g.s).
2. Groundwater not observed during performance of the test boring.
3. Boring backfilled with soil cuttings upon completion.
4. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

DUFFIELD ASSOCIATES
Soil, Water & the Environment

TEST BORING TB-07

Preliminary Geotechnical Evaluation
Colonial School District
Proposed Leach School
New Castle, Delaware
Project No. 12644.GA

Date Started	: July 9, 2020	Drilling Equipment	: Truck Mounted CME - 75
Date Completed	: July 9, 2020	Drilling Methods	: HSA (SPT, ASTM D 1586)
Logged by	: CTM	Surface Elevation	: 58 feet NAVD88
Weather	: Partly Cloudy, 80s		
Driller/Agency	: J. Blemming/CGC Geoservices, LLC		

Sample Condition: ☒ Remolded

Water Levels

Depth in feet	Surf. Elev. 58 ft	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0			ML	Brown SILT, trace to little fine sand, trace organics (roots) (moist)		S-1	2-4-4-5	1.4			
	56.0			Brown, orange fine SAND, trace to little clay (moist)		S-2	10-9-9-7	1.4			
5			SC	Brown, orange fine SAND, trace to little clay, trace gravel (moist)		S-3	9-9-11-10	1.2			
				Light brown fine SAND, little clay (moist)		S-4	5-5-4-5	1.4			
				Light brown, orange fine SAND, little clay, trace gravel (moist)		S-5	6-3-4-4	1.8			
10	48.0		SW	Light brown, orange fine SAND, trace clay (moist)		S-6	6-3-4-4	1.0			
	46.0			Test Boring Terminated at Approximately 12 feet							
15											
20											
25											
30											

NOTES:
1. Test boring terminated at ± 12 feet below existing ground surface (b.e.g.s).
2. Groundwater not observed during performance of the test boring.
3. Boring backfilled with soil cuttings upon completion.
4. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

DUFFIELD ASSOCIATES
Soil, Water & the Environment

TEST BORING TB-08

Preliminary Geotechnical Evaluation
Colonial School District
Proposed Leach School
New Castle, Delaware
Project No. 12644.GA

Date Started	: July 9, 2020	Drilling Equipment	: Truck Mounted CME - 75
Date Completed	: July 9, 2020	Drilling Methods	: HSA (SPT, ASTM D 1586)
Logged by	: CTM	Surface Elevation	: 62 feet NAVD88
Weather	: Partly Cloudy, 80s		
Driller/Agency	: J. Blemming/CGC Geoservices, LLC		

Sample Condition: ☒ Remolded

Water Levels

Depth in feet	Surf. Elev. 62 ft	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0			ML	Brown SILT, trace fine sand, trace organics (roots) (moist)		S-1	2-2-4-4	1.0			
	60.0			Brown fine SAND, little clay, trace gravel (possible reworked site soils) (moist)		S-2	3-3-5-8	1.2			
5				Light brown, orange fine SAND, trace clay, trace gravel (moist)		S-3	5-7-9-9	1.4			
			SC	Light brown, orange fine SAND, trace to little clay, trace gravel (moist)		S-4	9-6-9-11	1.2			
				Brown fine SAND, trace to little clay (moist)		S-5	9-6-6-6	1.4			
10				Light brown fine to medium SAND, trace clay (moist)		S-6	6-6-6-6	1.6			
	50.0			Test Boring Terminated at Approximately 12 feet							
15											
20											
25											
30											

NOTES:
1. Test boring terminated at ± 12 feet below existing ground surface (b.e.g.s).
2. Groundwater not observed during performance of the test boring.
3. Boring backfilled with soil cuttings upon completion.
4. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

DUFFIELD ASSOCIATES
Soil, Water & the Environment

TEST BORING TB-09

Preliminary Geotechnical Evaluation
Colonial School District
Proposed Leach School
New Castle, Delaware
Project No. 12644.GA

Date Started	: July 9, 2020	Drilling Equipment	: Truck Mounted CME - 75
Date Completed	: July 9, 2020	Drilling Methods	: HSA (SPT, ASTM D 1586)
Logged by	: CTM	Surface Elevation	: 61 feet NAVD88
Weather	: Partly Cloudy, 80s		
Driller/Agency	: J. Blemming/CGC Geoservices, LLC		

Sample Condition: ⊠ Remolded

Water Levels

Depth in feet	Surf. Elev. 61 ft	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0			ML	Brown SILT, trace fine sand, trace organics (roots) (moist)		S-1	2-3-4-2	1.2			
	59.0			Brown fine SAND, little clay, trace gravel, trace coarse sand (possible reworked site soils) (moist)		S-2	6-6-5-5	1.6			
5			SC	Brown, orange fine SAND, trace to little clay, trace gravel, trace coarse sand (moist)		S-3	7-7-8-10	1.7			
				Brown, orange fine SAND, little clay, trace gravel (moist)		S-4	6-9-5-4	1.2			
	53.0			Light brown, orange fine SAND, trace clay (moist)		S-5	5-4-5-6	1.4			
10			SW	Light brown, orange fine SAND, trace clay (moist)		S-6A	4-4-4-4	2.0			
	49.5					S-6B					
	49.0		CL	Red CLAY, trace to little fine sand (moist)							
				Test Boring Terminated at Approximately 12 feet							
15											
20											
25											
30											

NOTES:
1. Test boring terminated at ± 12 feet below existing ground surface (b.e.g.s).
2. Groundwater not observed during performance of the test boring.
3. Boring backfilled with soil cuttings upon completion.
4. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

DUFFIELD ASSOCIATES
Soil, Water & the Environment

TEST BORING TB-10

Preliminary Geotechnical Evaluation
Colonial School District
Proposed Leach School
New Castle, Delaware
Project No. 12644.GA

Date Started	: July 9, 2020	Drilling Equipment	: Truck Mounted CME - 75
Date Completed	: July 9, 2020	Drilling Methods	: HSA (SPT, ASTM D 1586)
Logged by	: CTM	Surface Elevation	: 63 feet NAVD88
Weather	: Partly Cloudy, 80s		
Driller/Agency	: J. Blemming/CGC Geoservices, LLC		

Sample Condition: ⊠ Remolded

Water Levels

Depth in feet	Surf. Elev. 63 ft	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0			ML	Brown SILT, trace fine sand, trace organics (roots) (moist)		S-1	1-3-3-2	1.6			
	61.0										
			SC	Brown fine SAND, little clay (possible reworked site soils) (moist)		S-2	4-5-5-7	1.4			
5				Light brown fine SAND, little clay, trace gravel (moist)		S-3	5-8-6-6	1.6	6.4	18.1	
	57.0			Test Boring Terminated at Approximately 6 feet							
10											
15											
20											
25											
30											

NOTES:
1. Test boring terminated at ± 6 feet below existing ground surface (b.e.g.s).
2. Groundwater not observed during performance of the test boring.
3. Boring backfilled with soil cuttings upon completion.
4. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

DUFFIELD ASSOCIATES
Soil, Water & the Environment

TEST BORING TB-11

Preliminary Geotechnical Evaluation
Colonial School District
Proposed Leach School
New Castle, Delaware
Project No. 12644.GA

Date Started	: July 9, 2020	Drilling Equipment	: Truck Mounted CME - 75
Date Completed	: July 9, 2020	Drilling Methods	: HSA (SPT, ASTM D 1586)
Logged by	: CTM	Surface Elevation	: 52 feet NAVD88
Weather	: Partly Cloudy, 80s		
Driller/Agency	: J. Blemming/CGC Geoservices, LLC		

Sample Condition: ⊠ Remolded

Water Levels

Depth in feet	Surf. Elev. 52 ft	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0			ML	Brown SILT, trace fine sand, trace organics (roots) (moist)		S-1	2-3-3-3	1.0			
	50.0										
			SC	Brown fine SAND, trace to little clay, trace gravel (possible reworked site soils) (moist)		S-2	4-7-9-8	1.6			
5				Orange, light brown fine SAND, trace clay (moist)		S-3	7-6-6-8	1.0			
	46.0			Test Boring Terminated at Approximately 6 feet							
10											
15											
20											
25											
30											

NOTES:
1. Test boring terminated at ± 6 feet below existing ground surface (b.e.g.s).
2. Groundwater not observed during performance of the test boring.
3. Boring backfilled with soil cuttings upon completion.
4. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

DUFFIELD ASSOCIATES
Soil, Water & the Environment

TEST BORING TB-12

Preliminary Geotechnical Evaluation
Colonial School District
Proposed Leach School
New Castle, Delaware
Project No. 12644.GA

Date Started	: July 9, 2020	Drilling Equipment	: Truck Mounted CME - 75
Date Completed	: July 9, 2020	Drilling Methods	: HSA (SPT, ASTM D 1586)
Logged by	: CTM	Surface Elevation	: 54 feet NAVD88
Weather	: Partly Cloudy, 80s		
Driller/Agency	: J. Blemming/CGC Geoservices, LLC		

Sample Condition: ☒ Remolded

Water Levels

Depth in feet	Surf. Elev. 54 ft	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0			ML	Brown SILT, little to some fine sand, trace organics (roots) (moist)		S-1	2-4-6-5	1.4			
	52.0										
			SC	Brown, orange fine SAND, little clay (possible reworked site soils) (moist)		S-2	5-4-4-3	1.8			
5				Orange fine to medium SAND, trace to little clay, trace gravel (moist)		S-3	5-6-6-6	0.6			
	48.0			Test Boring Terminated at Approximately 6 feet							
10											
15											
20											
25											
30											

NOTES:
1. Test boring terminated at ± 6 feet below existing ground surface (b.e.g.s).
2. Groundwater not observed during performance of the test boring.
3. Boring backfilled with soil cuttings upon completion.
4. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

DUFFIELD ASSOCIATES
Soil, Water & the Environment

TEST BORING TB-13

Preliminary Geotechnical Evaluation
Colonial School District
Proposed Leach School
New Castle, Delaware
Project No. 12644.GA

Date Started	: July 9, 2020	Drilling Equipment	: Truck Mounted CME - 75
Date Completed	: July 9, 2020	Drilling Methods	: HSA (SPT, ASTM D 1586)
Logged by	: CTM	Surface Elevation	: 56 feet NAVD88
Weather	: Partly Cloudy, 80s		
Driller/Agency	: J. Blemming/CGC Geoservices, LLC		

Sample Condition: ⊠ Remolded

Water Levels

Depth in feet	Surf. Elev. 56 ft	GRAPHIC	USCS	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
0			ML	Brown SILT, trace fine sand, trace organics (roots) (moist)		S-1	1-2-3-4	1.6			
	54.0										
			SC	Brown, orange fine SAND, little clay (possible reworked site soils) (moist)		S-2	6-6-4-6	1.2			
5				Brown, orange fine SAND, some clay (moist)		S-3	5-5-5-6	1.5	11.5	35.2	
	50.0			Test Boring Terminated at Approximately 6 feet							
10											
15											
20											
25											
30											

NOTES:
1. Test boring terminated at ± 6 feet below existing ground surface (b.e.g.s).
2. Groundwater not observed during performance of the test boring.
3. Boring backfilled with soil cuttings upon completion.
4. Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

DUFFIELD ASSOCIATES
Soil, Water & the Environment

GENERAL NOTES

DUFFIELD ASSOCIATES uses the following definitions and terminology to classify and correlate the field and laboratory samples.

VISUAL UNIFIED CLASSIFICATIONS: The soil samples are described by color, major constituent, modifiers (by percentage), and density (or consistency). Coarse Grained or Granular Soils have more than 50% of their dry weight retained on a No. 200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a No. 200 sieve; they are described as: clays or clayey silts if they are cohesive and silts if they are noncohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density and fine grained soils on the basis of their strength or consistency and their plasticity.

The Unified Soil Classification symbols are:

COARSE GRAINED SOILS

GW - Well graded gravels
GP - Poorly graded gravels
GM - Silty gravels
GC - Clayey gravels
SW - Well graded sands
SP - Poorly graded sands
SM - Silty sands
SC - Clayey sands

FINE GRAINED SOILS

ML - Silts of low plasticity
CL - Clays of low to medium plasticity
OL - Organic silt clays of low plasticity
MH - Silts of high plasticity
CH - Clays of high plasticity
OH - Organic silt clays of high plasticity
PT - Peat and highly organic soils

SIZE DESCRIPTION

F - Fine
M - Medium
C - Coarse
G - Gravel

MODIFIERS (PERCENTAGE)

Tr -	Trace	1 - 10%
Ltl -	Little	11 - 20%
Some		21 - 35%
& -	And	36 - 50%

COLOR

Or - Orange
Yel - Yellow
Br - Brown
Blk - Black
Gr - Gray
R - Red
Vc - Varicolored
Dk - Dark
Lt - Light

DENSITY: COARSE GRAINED SOILS

Very loose	4 blows/ft or less
Loose	5 to 10 blows/ft
Medium	11 to 30 blows/ft
Dense	31 to 50 blows/ft
Very Dense	51 blows/ft or more

CONSISTENCY: FINE GRAINED SOILS

Very soft	2 blows/ft or less
Soft	3 to 4 blows/ft
Medium	5 to 8 blows/ft
Stiff	9 to 15 blows/ft
Very stiff	16 to 30 blows/ft
Hard	31 blows/ft or more

NOTE: The Standard Penetration Test "N" value is the number of blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split spoon sampler, except where otherwise noted.

Contract A-01 : Sitework

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 1: Provide Additional Walking Surfaces in the Rear Walking Path Area

Add/Deduct _____($_____)

Alternate No. 2: Provide EPDM Playing Surfaces and Concrete Basketball Court at Rear Walking Path Area

Add/Deduct _____($_____)

Alternate No. 3: Provide Synthetic Play Surface in Courtyard #3

Add/Deduct _____ ($_____)

Alternate No. 4: Eliminate east parking area.

Add/Deduct _____ ($_____)

Alternate No. 11: Excess soils export.

Add/Deduct _____ ($_____)

UNIT PRICES

		BULK		TRENCH	
		Add	Deduct	Add	Deduct
1.	Price per Cubic Yard for earth excavation as specified In excavation section	_____c/y	_____c/y	_____c/y	_____c/y
2.	Price per cubic yard for earth excavation.	_____c/y	_____c/y	_____c/y	_____c/y
3.	Price per cubic yard for earth fill required to replace rock excavation, including finishing, placing and compacting.	_____s/y	_____s/y	_____s/y	_____s/y
4.	Price per cubic yard to supply & install Bio-Media Mix	_____c/y	_____c/y	_____c/y	_____c/y
5.	Price per cubic yard for excavation and backfill With select material	_____c/y	_____c/y	_____c/y	_____c/y
6.	Price per cubic yard to undercut subgrade and backfill with imported structural fill material. Spoils to be exported from site.	_____c/y	_____c/y	_____c/y	_____c/y
7.	Price per cubic yard to undercut subgrade and backfill with on-site mined structural fill. Spoils to be exported from site.	_____c/y	_____c/y	_____c/y	_____c/y
8.	Price per cubic yard to undercut footings subgrade and backfill with select spoils to be placed on site	_____c/y	_____c/y	_____c/y	_____c/y
9.	Price per cubic yard to undercut subgrade and backfill with 106A stone. Spoils to be exported from site.	_____c/y	_____c/y	_____c/y	_____c/y
10.	Price per cubic yard to load trucks provided by William Penn Sitework contractor above Quantity stated in Alternate 11	_____c/y	_____c/y	_____c/y	_____c/y

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS
Sub-Contractor List

Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Sitework			
2.	Asphalt Paving			
3.	Concrete Flatwork			
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-01 : Sitework have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-02 : Landscaping

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 1: Provide Additional Walking Surfaces in the Rear Walking Path Area

Add/Deduct _____($_____)

Alternate No. 2: Provide EPDM Playing Surfaces and Concrete Basketball Court at Rear Walking Path Area

Add/Deduct _____($_____)

Alternate No. 3: Provide Synthetic Play Surface in Courtyard #3

Add/Deduct _____($_____)

Alternate No. 4: Eliminate east parking area.

Add/Deduct _____($_____)

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____

_____

_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Landscaping			
2.	Grass Seeding			
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-02 : Landscaping have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-03 : Concrete

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 7: Modify Selected Interior Partitions from Masonry to Drywall

Add/Deduct _____($_____)

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Concrete			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-03 : Concrete have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-04 : Masonry

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 6: Face Brick Alternate Product

Add/Deduct _____($_____)

Alternate No. 7: Modify Selected Interior Partitions from Masonry to Drywall

Add/Deduct _____($_____)

Alternate No. 10: Add Greenhouse in Courtyard

Add/Deduct _____($_____)

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Masonry			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-04 : Masonry have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-05 : Structural Steel & Miscellaneous Metals

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES Not Applicable
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety

Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Structural Steel			
2.	Miscellaneous Metals			
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-05 : Structural Steel have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-06 : Carpentry & General Works

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 6: Provide Pergola in Courtyard #3

Add/Deduct _____($_____)

Alternate No. 7: Modify Selected Interior Partitions from Masonry to Drywall

Add/Deduct _____($_____)

Alternate No. 8: Reduce Drywall Soffits

Add/Deduct _____($_____)

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Carpentry			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-06 : Carpentry have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-07 : Roofing

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES Not Applicable
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond

Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Roofing			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-07 : Roofing have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-08 : Waterproofing

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES Not Applicable
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL) _____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond

Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Waterpoofing			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-08 : Waterproofing have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-09 : Exterior Metal Panels

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES Not Applicable
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond

Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Metal Panels			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-09 : Exterior Metal Panels have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-10 : Joint Sealants

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES Not Applicable
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond

Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Joint Sealants			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-10 : Joint Sealants have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-11 : Hollow Metal and Finish Hardware

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES Not Applicable
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL) _____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond

Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Hollow Metal Doors/Frames			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-11 : Hollow Metal and Finish Hardware have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-12 : Glass and Glazing

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES Not Applicable
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond

Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Aluminum Storefronts			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-12 : Glass and Glazing have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-13 : Metal Studs & Drywall

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 7: Modify Selected Interior Partitions from Masonry to Drywall

Add/Deduct _____($_____)

Alternate No. 8: Reduce Drywall Soffits

Add/Deduct _____($_____)

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Metal Stud Framing			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-13 : Metal Studs & Drywall have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-14 : Casework and Millwork

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES Not Applicable
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 8: Reduce Drywall Soffits

Add/Deduct _____($_____)

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Casework			
2.	Millwork			
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-14 : Casework & Millwork have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-15 : Ceramic Tile

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES Not Applicable
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Ceramic Tile			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-15 : Ceramic Tile have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-16 : Acoustical Ceilings

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 8: Reduce Drywall Soffits

Add/Deduct _____($_____)

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Acoustical Ceilings			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-16 : Acoustical Ceilings have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-17 : Paint and VWC

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 8: Reduce Drywall Soffits

Add/Deduct _____($_____)

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Paint			
2.	Wallcoverings			
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-17 : Paint and VWC have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-18 : Flooring

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES Not Applicable
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Flooring			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-18 : Flooring have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-19 : Fluid-Applied Flooring

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES Not Applicable
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Fluid-Applied Flooring			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-19 : Fluid-Applied Flooring have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-20 : Kitchen Equipment

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 9: Add Vocational Kitchen Equipment

Add/Deduct _____($_____)

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Kitchen Equipment			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-20 : Kitchen Equipment have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-21 : Swimming Pools

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES Not Applicable
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Swimming Pools			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-21 : Swimming Pools have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-22 : Fire Protection

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 8: Reduce Drywall Soffits

Add/Deduct _____($_____)

Alternate No. 9: Add Vocational Kitchen Equipment

Add/Deduct _____($_____)

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Fire Protection			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-22 : Fire Protection have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-23 : Plumbing

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 9: Add Vocational Kitchen Equipment

Add/Deduct _____($_____)

Alternate No. 10: Add Greenhouse in Courtyard

Add/Deduct _____($_____)

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Plumbing			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-23 : Plumbing have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-24 : Mechanical

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 9: Add Vocational Kitchen Equipment

Add/Deduct _____($_____)

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Mechanical			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-24 : Mechanical have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-25 : Building Management Systems

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 9: Add Vocational Kitchen Equipment

Add/Deduct _____($_____)

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Building Management Systems			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-25 : Building Management Systems have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-26 : Electrical

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 4: Eliminate east parking area.

Add/Deduct _____($_____)

Alternate No. 8: Reduce Drywall Soffits

Add/Deduct _____($_____)

Alternate No. 9: Add Vocational Kitchen Equipment

Add/Deduct _____($_____)

Alternate No. 10: Add Greenhouse in Courtyard

Add/Deduct _____($_____)

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Electrical			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-26 : Electrical have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-27 : Special Systems

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 4: Provide east parking area.

Add/Deduct _____($_____)

Alternate No. 8: Reduce Drywall Soffits

Add/Deduct _____($_____)

Alternate No. 9: Add Vocational Kitchen Equipment

Add/Deduct _____($_____)

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Security			
2.	Fire Alarm			
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-27 : Special Systems have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-28 : Structured Cabling

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 4: Provide east parking area.

Add/Deduct _____($_____)

Alternate No. 9: Add Vocational Kitchen Equipment

Add/Deduct _____($_____)

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Tele/Data			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-28 : Structured Cabling have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

Contract A-29 : Testing Adjusting and Balancing

BID FORM

For Bids Due: _____ To: ***Colonial School District***
701 East Basin Road
New Castle, DE 19720

Name of Bidder: _____

Bidder Address: _____

_____

Contact Name: _____ E-Mail Address: _____

Delaware Business License No.:_____ Taxpayer ID No.: _____

(Other License Nos.): _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

Phone No.: ( ) _____ - _____ Fax No.: ( ) _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____ ($_____)

ALTERNATES
Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

Alternate No. 9: Add Vocational Kitchen Equipment

Add/Deduct _____($_____)

UNIT PRICES Not Applicable

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed fifteen percent (15%).

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for sixty (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _ calendar days of the Notice to Proceed.
The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

Witness: _____ By: _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
Affidavit of Employee Drug Testing Program
Affidavit of Contractor Qualifications
Affidavit of Craft Training Compliance
Bid Security
Delaware Business License
New Castle County Contractor's License
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

	Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	Testing Adjusting Balancing			
2.				
3.				
4.				
5.				

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date

All the terms and conditions of Contract A-29 : Testing Adjusting and Balancing have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____of _____in the County of _____ and State of _____ as Principal, and _____of _____in the County of _____ _____ and State of _____ as Surety, legally authorized to do business in the State of Delaware ('State"), are held and firmly unto the Colonial School District in the sum of _____ Dollars (S_____), or percent not to exceed _____ Dollars (S_____) of amount of bid on Contract No. _____ to be paid to the Colonial School District for the use and benefit of the Colonial School District for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded Principal who has submitted to the Colonial School District a certain proposal to enter into this contract for the furnishing of certain material and/or services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute this Contract as may be required by the terms of this Contract and approved by the Colonial School District this Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____seal and dated this____day of _____in the year of our Lord two thousand and _____(20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

_____
Name of Bidder (Organization)

Corporate Seal

By:_____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness_____ _____

_____
Title

CONSENT OF SURETY

DATE_____

To: Colonial School District
701 East Basin Road
New Castle, DE 19720

Gentlemen:

We, the _____

_____
(Surety Company's Address)

_____

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

_____
(Contractor)

_____
(Address)

_____

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

_____
(Surety Company)

By _____
(Attorney-in-Fact)

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite, including subcontractors, that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of_____ 20_____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

END OF SECTION

SECTION 005200 - AGREEMENT

1. SUMMARY

A. The Agreement Form for this Project is the American Institute of Architects Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, AIA Document A132 – 2019

B. A copy of AIA Document A132 - 2019 Edition is bound into this Project Manual following this page.

1. Under Article 5.1.4.5 add the following:

"Upon completion of the work under the Contract, the Owner may release 60% of the amount then retained. The balance of the amount retained will be held until:

a. All reports required of the Contract are received;
b. All Subcontractors in trades listed on the Bid Form are paid by the Contractor, unless the amount owed to the Subcontractor is disputed, in which case the Owner may withhold 150% of the amount withheld by the Contractor in its dispute with the Subcontractor; and
c. Final payment is authorized by the Owner."

END OF SECTION

DRAFT

AIA® Document A132™ – 2019

Standard Form of Agreement Between Owner and Contractor,
Construction Manager as Adviser Edition

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month, and year.)

BETWEEN the Owner:
(Name, legal status, address, and other information)

« »« »
« »
« »
« »

and the Contractor:
(Name, legal status, address, and other information)

« »« »
« »
« »
« »

for the following Project:
(Name, location, and detailed description)

«Blank AIAs»
« »
« »

The Construction Manager:
(Name, legal status, address, and other information)

« »« »
« »
« »
« »

The Architect:
(Name, legal status, address, and other information)

« »« »
« »
« »
« »

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser. AIA Document A232™–2019 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than Modifications, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND DATES OF SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[« »] The date of this Agreement.

[« »] A date set forth in a notice to proceed issued by the Owner.

[« »] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

« »

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion of the Project or Portions Thereof

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the date of Substantial Completion of the Work of all of the Contractors for the Project will be:
(Insert the date of Substantial Completion of the Work of all Contractors for the Project.)

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« »

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of all of the Contractors for the Project are to be completed prior to Substantial Completion of the entire Work of all of the Contractors for the Project, the Contractors shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.4 When the Work of this Contract, or any Portion Thereof, is Substantially Complete

§ 3.4.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall substantially complete the entire Work of this Contract:
(Check one of the following boxes and complete the necessary information.)

[« »] Not later than « » (« ») calendar days from the date of commencement of the Work.

[« »] By the following date: « »

§ 3.4.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work of this Contract are to be substantially complete prior to when the entire Work of this Contract shall be substantially complete, the Contractor shall substantially complete such portions by the following dates:

Portion of Work	Date to be substantially complete

§ 3.4.3 If the Contractor fails to substantially complete the Work of this Contract, or portions thereof, as provided in this Section 3.4, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be one of the following:
(Check the appropriate box.)

[« »] Stipulated Sum, in accordance with Section 4.2 below

[« »] Cost of the Work plus the Contractor's Fee, in accordance with Section 4.3 below

[« »] Cost of the Work plus the Contractor's Fee with a Guaranteed Maximum Price, in accordance with Section 4.4 below

(Based on the selection above, complete Section 4.2, 4.3 or 4.4 below.)

§ 4.2 Stipulated Sum

§ 4.2.1 The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2.2 Alternates

§ 4.2.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

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Item	Price	Conditions for Acceptance

§ 4.2.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.2.4 Unit prices, if any:
(Identify the item and state the unit price, and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3 Cost of the Work Plus Contractor's Fee without a Guaranteed Maximum Price

§ 4.3.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.3.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

« »

§ 4.3.3 The method of adjustment of the Contractor's Fee for changes in the Work:

« »

§ 4.3.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

« »

§ 4.3.5 Rental rates for Contractor-owned equipment shall not exceed « » percent (« » %) of the standard rental rate paid at the place of the Project.

§ 4.3.6 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.3.7 The Contractor shall prepare and submit to the Construction Manager, within 14 days of executing this Agreement, a written Control Estimate for the Owner's review and approval. The Control Estimate shall include the items in Section B.1 of Exhibit B, Determination of the Cost of the Work.

§ 4.4 Cost of the Work Plus Contractor's Fee with a Guaranteed Maximum Price

§ 4.4.1 The Cost of the Work is as defined in Exhibit B, Determination of the Cost of the Work.

§ 4.4.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee.)

« »

§ 4.4.3 The method of adjustment of the Contractor's Fee for changes in the Work:

« »

§ 4.4.4 Limitations, if any, on a Subcontractor's overhead and profit for increases in the cost of its portion of the Work:

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« »

§ 4.4.5 Rental rates for Contractor-owned equipment shall not exceed « » percent (« » %) of the standard rental rate paid at the place of the Project.

§ 4.4.6 Unit Prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.4.7 Guaranteed Maximum Price

§ 4.4.7.1 The Contract Sum is guaranteed by the Contractor not to exceed « » ($ « »), subject to additions and deductions by Change Order as provided in the Contract Documents. This maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner.

§ 4.4.7.2 Alternates

§ 4.4.7.2.1 Alternates, if any, included in the Guaranteed Maximum Price:

Item	Price

§ 4.4.7.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.4.7.3 Allowances, if any, included in the Guaranteed Maximum Price:
(Identify each allowance.)

Item	Price

§ 4.4.7.4 Assumptions, if any, upon which the Guaranteed Maximum Price is based:
(Identify each assumption.)

« »

§ 4.4.8 To the extent that the Contract Documents are anticipated to require further development, the Guaranteed Maximum Price includes the costs attributable to such further development consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include changes in scope, systems, kinds and quality of materials, finishes, or equipment, all of which, if required, shall be incorporated by Change Order.

§ 4.4.9 The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in Section 4.4.7.4. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the agreed-upon assumptions contained in Section 4.4.7.4 and the revised Contract Documents.

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any, to be assessed in accordance with Section 3.4.)

« »

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§ 4.6 Other:
(Insert provisions for bonus, cost savings or other incentives, if any, that might result in a change to the Contract Sum.)

« »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Construction Manager by the Contractor, and Certificates for Payment issued by the Construction Manager and Architect, the Owner shall make progress payments on account of the Contract Sum, to the Contractor, as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

§ 5.1.3 Provided that an Application for Payment is received by the Construction Manager not later than the « » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Construction Manager after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « » (« ») days after the Construction Manager receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Progress Payments Where the Contract Sum is Based on a Stipulated Sum

§ 5.1.4.1 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.4.2 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.4.3 In accordance with AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.4.3.1 The amount of each progress payment shall first include:

- **.1** That portion of the Contract Sum properly allocable to completed Work;
- **.2** That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.4.3.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019; and
- **.5** Retainage withheld pursuant to Section 5.1.7.

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§ 5.1.5 Progress Payments Where the Contract Sum is Based on the Cost of the Work without a Guaranteed Maximum Price

§ 5.1.5.1 With each Application for Payment, the Contractor shall submit the cost control information required in Exhibit B, Determination of the Cost of the Work, along with payrolls, petty cash accounts, receipted invoices, or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor, plus payrolls for the period covered by the present Application for Payment, less that portion of the payments attributable to the Contractor's Fee.

§ 5.1.5.2 Applications for Payment shall show the Cost of the Work actually incurred by the Contractor through the end of the period covered by the Application for Payment and for which the Contractor has made or intends to make actual payment prior to the next Application for Payment.

§ 5.1.5.3 In accordance with AIA Document A232-2019 and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.5.3.1 The amount of each progress payment shall first include:

.1 The Cost of the Work as described in Exhibit B, Determination of the Cost of the Work;

.2 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and

.3 The Contractor's Fee computed upon the Cost of the Work described in the preceding Section 5.1.5.3.1.1 at the rate stated in Section 4.3.2; or if the Contractor's Fee is stated as a fixed sum in Section 4.3.2 an amount which bears the same ratio to that fixed-sum Fee as the Cost of the Work included in Section 5.1.5.3.1.1 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

§ 5.1.5.3.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;

.5 The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.5.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and

.6 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.5.4 The Owner, Construction Manager and Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.5.5 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor, and such action shall not be deemed to be a representation that (1) the Construction Manager and Architect have made a detailed examination, audit or arithmetic verification of the documentation submitted in accordance with Article 5 or other supporting data; (2) that the Construction Manager and Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager and Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.5.6 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.1.5.7 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

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§ 5.1.6 Progress Payments Where the Contract Sum is Based on the Cost of the Work with a Guaranteed Maximum Price

§ 5.1.6.1 With each Application for Payment, the Contractor shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner, Construction Manager or Architect to demonstrate that payments already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor plus payrolls for the period covered by the present Application for Payment, less that portion of the progress payments attributable to the Contractor's Fee.

§ 5.1.6.2 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Guaranteed Maximum Price among: (1) the various portions of the Work; (2) any contingency for costs that are included in the Guaranteed Maximum Price but not otherwise allocated to another line item or included in a Change Order; and (3) the Contractor's Fee.

§ 5.1.6.2.1 The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Construction Manager and Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.6.2.2 The allocation of the Guaranteed Maximum Price under this Section 5.1.6.2 shall not constitute a separate guaranteed maximum price for the Cost of the Work of each individual line item in the schedule of values.

§ 5.1.6.2.3 When the Contractor allocates costs from a contingency to another line item in the schedule of values, the Contractor shall submit supporting documentation to the Architect and Construction Manager.

§ 5.1.6.3 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment. The percentage of completion shall be the lesser of (1) the percentage of that portion of the Work which has actually been completed; or (2) the percentage obtained by dividing (a) the expense that has actually been incurred by the Contractor on account of that portion of the Work and for which the Contractor has made payment or intends to make payment prior to the next Application for Payment by (b) the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values.

§ 5.1.6.4 In accordance with AIA Document A232-2019, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.4.1 The amount of each progress payment shall first include:

.1 That portion of the Guaranteed Maximum Price properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Guaranteed Maximum Price allocated to that portion of the Work in the most recent schedule of values;

.2 That portion of the Guaranteed Maximum Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction or, if approved in writing in advance by the Owner, suitably stored off the site at a location agreed upon in writing;

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified; and

.4 The Contractor's Fee, computed upon the Cost of the Work described in the preceding Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 at the rate stated in Section 4.4.2 or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work included in Sections 5.1.6.4.1.1 and 5.1.6.4.1.2 bears to a reasonable estimate of the probable Cost of the Work upon its completion.

§ 5.1.6.4.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A232–2019;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

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.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A232–2019;

.5 The shortfall, if any, indicated by the Contractor in the documentation required by Section 5.1.6.1 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and

.6 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.6.5 The Owner and the Contractor shall agree upon a mutually acceptable procedure for review and approval of payments to Subcontractors and the percentage of retainage held on Subcontracts, and the Contractor shall execute subcontracts in accordance with those agreements.

§ 5.1.6.6 In taking action on the Contractor's Applications for Payment, the Construction Manager and Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Contractor and such action shall not be deemed to be a representation that (1) the Construction Manager or Architect have made a detailed examination, audit, or arithmetic verification of the documentation submitted in accordance with Section 5.1.6.1 or other supporting data; (2) that the Construction Manager or Architect have made exhaustive or continuous on-site inspections; or (3) that the Construction Manager or Architect have made examinations to ascertain how or for what purposes the Contractor has used amounts previously paid on account of the Contract. Such examinations, audits, and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 5.1.6.7 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.1.6.8 If final completion of the Work is materially delayed through no fault of the Contractor, then the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A232-2019.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to when the Work of this Contract is substantially complete, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

« »

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

« »

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to when the entire Work of this Contract is substantially complete, including modifications for completion of portions of the Work as provided in Section 3.4.2, insert provisions for such modifications.)

« »

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, when the Work of this Contract is substantially complete, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted when the Work of this Contract is substantially complete shall not include retainage as follows:
(Insert any other conditions for release of retainage when the Work of this Contract is substantially complete, or upon Substantial Completion of the Work of all Contractors on the Project or portions thereof.)

« »

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§ 5.2 Final Payment

§ 5.2.1 Final Payment Where the Contract Sum is Based on a Stipulated Sum

§ 5.2.1.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect.

§ 5.2.1.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

« »

§ 5.2.2 Final Payment Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 5.2.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A232–2019, and to satisfy other requirements, if any, which extend beyond final payment;

.2 the Contractor has submitted a final accounting for the Cost of the Work, pursuant to Exhibit B, Determination of the Cost of the Work and a final Application for Payment; and

.3 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect in accordance with Exhibit B, Determination of the Cost of the Work.

§ 5.2.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

« »

§ 5.3 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

« » % « »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Article 15 of AIA Document A232–2019, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »
« »
« »

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A232–2019, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[« »] Arbitration pursuant to Article 15 of AIA Document A232–2019.

[« »] Litigation in a court of competent jurisdiction.

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[« »] Other: *(Specify)*

« »

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 Where the Contract Sum is a Stipulated Sum

§ 7.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.1.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

« »

§ 7.1.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019.

§ 7.2 Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 7.2.1 Termination

§ 7.2.1.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232–2019.

§ 7.2.1.2 Termination by the Owner for Cause

§ 7.2.1.2.1 If the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232–2019, the Owner shall then only pay the Contractor an amount as follows:

.1 Take the Cost of the Work incurred by the Contractor to the date of termination;

.2 Add the Contractor's Fee, computed upon the Cost of the Work to the date of termination at the rate stated in Section 4.3.2 or 4.4.2, as applicable, or, if the Contractor's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum Fee as the Cost of the Work at the time of termination bears to a reasonable estimate of the probable Cost of the Work upon its completion;

.3 Subtract the aggregate of previous payments made by the Owner; and

.4 Subtract the costs and damages incurred, or to be incurred, by the Owner under Article 14 of AIA Document A232–2019.

§ 7.2.1.2.2 When the Contract Sum is based on the Cost of the Work with a Guaranteed Maximum Price, if the Owner terminates the Contract for cause as provided in Article 14 of AIA Document A232-2019, the amount, if any, to be paid to the Contractor under Article 14 of AIA Document A232-2019 shall not cause the Guaranteed Maximum Price to be exceeded, nor shall it exceed the amount calculated in Section 7.2.1.2.1.

§ 7.2.1.2.3 The Owner shall also pay the Contractor fair compensation, either by purchase or rental at the election of the Owner, for any equipment owned by the Contractor that the Owner elects to retain and that is not otherwise included in the Cost of the Work under Section 7.2.1.2.1.1. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Contractor shall, as a condition of receiving the payments referred to in this Article 7, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Contractor, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Contractor under such subcontracts or purchase orders. All Subcontracts, purchase orders and rental agreements entered into by the Contractor will contain provisions allowing for assignment to the Owner as described above.

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§ 7.2.1.3 Termination by the Owner for Convenience

If the Owner terminates the Contract for convenience in accordance with Article 14 of AIA Document A232–2019, then the Owner shall pay the Contractor a termination fee as follows:

(Insert the amount of or method for determining the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

« »

§ 7.3 Suspension

The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232–2019; in such case, the Contract Sum and Contract Time shall be increased as provided in Article 14 of AIA Document A232–2019, except that the term "profit" shall be understood to mean the Contractor's Fee as described in Section 4.3.2 or 4.4.2, as applicable, of this Agreement.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A232–2019 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:

(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.3 The Contractor's representative:

(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A132™–2019, Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A232–2019, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

« »

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§ 8.7 Relationship of the Parties

Where the Contract is based on the Cost of the Work plus the Contractor's Fee, with or without a Guaranteed Maximum Price, the Contractor accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and exercise the Contractor's skill and judgment in furthering the interests of the Owner; to furnish efficient business administration and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner's interests. The Owner agrees to furnish and approve, in a timely manner, information required by the Contractor and to make payments to the Contractor in accordance with the requirements of the Contract Documents.

§ 8.8 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition

.2 AIA Document A132™–2019, Exhibit A, Insurance and Bonds Exhibit

.3 AIA Document A232™–2019, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

« »

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document A132™–2019, Exhibit B, Determination of the Cost of the Work

[« »] AIA Document E235™–2019, Sustainable Projects Exhibit, Construction Manager as Adviser Edition, dated as indicated below:
(Insert the date of the E235-2019 incorporated into this Agreement.)

« »

[« »] The Sustainability Plan:

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Title	Date	Pages

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A232–2019 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

« »

This Agreement is entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
« »« »	« »« »
(Printed name and title)	*(Printed name and title)*

DRAFT

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SECTION 00 52 00

SUPPLEMENT TO A132-2019 – EXHIBIT A - INSURANCE AND BONDS

The following supplements modify the "Standard Form of Agreement Between Owner and Contractor, *Construction Manager as Adviser Edition*" AIA Document A132-2019 Exhibit A Insurance and Bonds. Where a portion of the Standard Form of Agreement, Exhibit A is modified or deleted by the following, the unaltered portions of the Standard Form of Agreement, Exhibit A shall remain in effect.

ARTICLE A.2 OWNER'S INSURANCE

A.2.1 General

Delete paragraph A.2.1 in its entirety.

A.2.2 Liability Insurance

Delete paragraph A.2.2 in its entirety, except in the case of school projects this paragraph shall remain.

A.2.3 Required Property Insurance

Delete paragraph A.2.3 in its entirety.

A.2.4 Optional Extended Property Insurance

Delete paragraph A.2.4 in its entirety.

A.2.5 Other Optional Insurance

Delete paragraph A.2.5 in its entirety.

ARTICLE A.3 CONTRACTORS INSURANCE AND BONDS

A.3.1.1 Strike the last sentence of the paragraph.

A.3.1.3 Additional Insured Obligations

In the first sentence after "coverage to include (1)" delete "(1) the Owner,".

Strike the remainder of the first sentence beginning at the semicolon "; and (2) the Owner" through the end of the sentence.

Delete the second sentence in its entirety.

A.3.2.2.1 Insert "$1,000,000.00" in the blank for each occurrence.
Insert "$3,000,000.00" in the blank for general aggregate.
Insert "$3,000,000.00" in the blank for aggregate for products-completed operations hazard.

A.3.2.3 Insert "$1,000,000.00" in the blank for per accident.

A.3.2.6 Insert “$500,000.00” in the blank for each accident.
Insert “$500,000.00” in the blank for each employee.
Insert “$500,000.00” in the blank for policy limit.

A.3.2.8 Insert “$1,000,000.00” in the blank for per claim.
Insert “$3,000,000.00” in the blank for in the aggregate.

A.3.2.9 Insert “$1,000,000.00” in the blank for per claim.
Insert “$3,000,000.00” in the blank for in the aggregate.

A.3.2.10 Insert “$2,000,000.00” in the blank for per claim.
Insert “$4,000,000.00” in the blank for in the aggregate.

A.3.2.11 Strike in its entirety.

A.3.2.12 Strike in its entirety.

A.3.3.2.1 Delete paragraph 3.3.2.1 in its entirety

A.3.3.2.2 Strike in its entirety.

A.3.3.2.3 Insert “$1,000,000.00” in the blanks for per claim.
Insert “$3,000,000.00” in the blanks for in the aggregate.

A.3.4 Insert the actual contract price in both the Payment Bond and the Performance Bond Penal Sum blanks. It must be 100% of the contract price.

Strike the last sentence in this section and replace with “Payment and Performance Bonds shall be in the standard form issued by the Delaware Office of Management and Budget.”

END OF SECTION

SECTION 006113 – PERFORMANCE AND PAYMENT BONDS

1. PERFORMANCE AND PAYMENT BONDS

   A. Bonds must be in the following form:

      1. Form of Performance Bond (attached).
      2. Form of Payment Bond (attached).

SECTION 006113 - FORM OF PAYMENT BOND

Bond Number:

KNOW ALL PERSONS BY THESE PRESENTS, that we, _____, as principal ("Principal"), and _____, a _____ corporation, legally authorized to do business in the State of Delaware, as surety ("Surety"), are held and firmly bound unto the State of Delaware, Colonial School District ("Owner"), in the amount of _____ _____ ($_____), to be paid to Owner, for which payment well and truly to be made, we do bind ourselves, our and each and every of our heirs, executors, administrations, successors and assigns, jointly and severally, for and in the whole firmly by these presents.

Sealed with our seals and dated this _____ day of_____, 20____.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH, that if Principal, who has been awarded by Owner that certain contract known as Contract No. _____dated the _____ day of _____, 20____(the "Contract"), which Contract is incorporated herein by reference, shall well and truly pay all and every person furnishing materials or performing labor or service in and about the performance of the work under the Contract, all and every sums of money due him. her, them or any of them, for all such materials, labor and service for which Principal is liable, shall make good and reimburse Owner sufficient funds to pay such costs in the completion of the Contract as Owner may sustain by reason of any failure or default on the part of Principal, and shall also indemnity and save harmless Owner from all costs, damages and expenses arising out of or by reason of the performance of the Contract and for as long as provided by the Contract; then this obligation shall be void, otherwise to be and remain in full force and effect.

Surety, for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of Surety and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition or change in or to the Contract or the work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any work to be performed or any monies due or to become due thereunder; and Surety hereby waives notice of any and all such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to Surety as though done or omitted to be done by or in relation to Principal.

Surety hereby stipulates and agrees that no modifications, omission or additions in or to the terms of the Contract shall in any way whatsoever affect the obligation of Surety and its bond. Any proceeding, legal or equitable, under this Bond may be brought in any court of competent jurisdiction in the State of Delaware. Notices to Surety or Contractor may be mailed or delivered to them at their respective addresses shown below.

IN WITNESS WHEREOF, Principal and Surety have hereunto set their hand and seals, and such of them as are corporations have caused their corporate seal to be hereto affixed and these presents to be signed by their duly authorized officers, the day and year first above written.

Witness or Attest: PRINCIPAL

By: _____ (Seal) _____

Name: _____

Address: _____

Title: _____

(Corporate Seal)

Witness or Attest: SURETY

By: _____ (Seal) _____

Name: _____

Address: _____

Title: _____

(Corporate Seal)

SECTION 00 61 13 - FORM OF PERFORMANCE BOND

Bond Number: _____

KNOW ALL PERSONS BY THESE PRESENTS, that we, _____, as principal ("Principal"), and _____, a _____ corporation, legally authorized to do business in the State of Delaware, as surety ("Surety"), are held and firmly bound unto the State of Delaware, Colonial School District ("Owner"), in the amount of_____ _____ ($_____) to be paid to Owner, for which payment well and truly to be made, we do bind ourselves, our and each and every of our heirs, executors, administrations, successors and assigns. jointly and severally, for and in the whole, firmly by these presents.

Sealed with our seals and dated this _____ day of _____, 20___.

NOW THE CONDITION OF THIS OBLICATION IS SUCH, that if Principal, who has been awarded by Owner that certain contract known as Contract No. _____ dated the _____ day of _____, 20__ (the "Contract"), which Contract is incorporated herein by reference, shall well and truly provide and furnish all materials, appliances and tools and perform all the work required under and pursuant to the terms and conditions of the Contract and the Contract Documents (as defined in the Contract) or any changes or modifications thereto made as therein provided, shall make good and reimburse Owner sufficient funds to pay the costs of completing the Contract that Owner may sustain by reason of any failure or default on the part of Principal, and shall also indemnify and save harmless Owner from all costs, damages and expenses arising out of or by reason of the performance of the Contract and for as long as provided by the Contract; then this obligation shall be void, otherwise to be and remain in full force and effect.

Surety, for value received, hereby stipulates and agrees, if requested to do so by Owner, to fully perform and complete the work to be performed under the Contract pursuant to the terms, conditions and covenants thereof, if for any cause Principal fails or neglects to so fully perform and complete such work

Surety, for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of Surety and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition or change in or to the Contract or the work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any work to be performed or any monies due or to become due thereunder; and Surety hereby waives notice of any and all such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to Surety as though done or omitted to be done by or in relation to Principal.

Surety hereby stipulates and agrees that no modifications, omissions or additions in or to the terms of the Contract shall in any way whatsoever affect the obligation of Surety and its bond.

Any proceeding, legal or equitable, under this Bond may be brought in any court of competent jurisdiction in the State of Delaware. Notices to Surety or Contractor may be mailed or delivered to them at their respective addresses shown below.

IN WITNESS WHEREOF, Principal and Surety have hereunto set their hand and seals, and such of them as are corporations have caused their corporate seal to be hereto affixed and these presents to be signed by their duly authorized officers, the day and year first above written.

Witness or Attest: PRINCIPAL

By: _____ (Seal) _____

Name: _____

Title: _____

(Corporate Seal)

Witness or Attest: SURETY

By: _____ (Seal) _____

Name: _____

Title: _____

(Corporate Seal)

END OF SECTION

SECTION 006216 – CERTIFICATE OF INSURANCE

In conjunction with Insurance Requirements AIA General Conditions, Article 11, the Contractor shall be bound by the following limits of liability insurance (for Contracts under this Bid Pac). The Contractor shall use the standard "ACCORD" for titled "Certificate of Insurance" in submitting his liability insurance limits. The required limits to be inserted in accordance with the sample "ACCORD" form in this section:

GENERAL NOTES

1. Other Insurance

    A. Contractor shall carry any necessary insurance required to cover Owned and Rental equipment that may be necessary for them to use in the performance of the Work.

2. Contractor shall have the following additional items added to his required "ACCORD" form Certificate of Insurance:

    A. Name and Address of Insured (Contractor).

    B. Description of Operations/Locations -

3. Added Insured – Colonial School District & EDiS Company

4. Certificate Holder – Colonial School District

Contractors shall note that although not a part of AIA Document A232 - 2019 Edition, these additional articles apply as noted to this Project.

A sample certificate is bound into the Project Manual immediately following this Document.

END OF SECTION

Professional Liability and Pollution Insurance Requirements

Contract Number	Contract Name	Professional Liability Insurance	Pollution Insurance
Contract A-01:	Sitework	Y	Y
Contract A-02:	Landscaping	N	Y
Contract A-03:	Concrete	N	Y
Contract A-04:	Masonry	N	Y
Contract A-05:	Structural Steel & Miscellaneous Metals	Y	Y
Contract A-06:	Carpentry & General Works	N	Y
Contract A-07:	Roofing	Y	Y
Contract A-08:	Waterproofing	Y	Y
Contract A-09:	Exterior Metal Panels	Y	N
Contract A-10:	Joint Sealants	N	Y
Contract A-11:	Hollow Metal and Finish Hardware	N	N
Contract A-12:	Glass and Glazing	Y	Y
Contract A-13:	Metal Studs and Drywall	Y	N
Contract A-14:	Casework and Millwork	Y	Y
Contract A-15:	Ceramic Tile	N	N
Contract A-16:	Acoustical Ceilings	N	N
Contract A-17:	Paint and VWC	N	Y
Contract A-18:	Flooring	N	Y
Contract A-19:	Fluid Applied Flooring	N	Y
Contract A-20:	Kitchen Equipment	N	N
Contract A-21:	Swimming Pools	Y	Y
Contract A-22:	Fire Protection	Y	Y
Contract A-23:	Plumbing	Y	Y
Contract A-24:	Mechanical	Y	Y
Contract A-25:	Building Management Systems	Y	N
Contract A-26:	Electrical	N	N
Contract A-27:	Special Systems	Y	N
Contract A-28:	Structured Cabling	Y	N
Contract A-29:	Testing Adjusting and Balancing	Y	N

SECTION 007200 – GENERAL CONDITIONS

1. SUMMARY

A. The General Conditions for this Project are the American Institute of Architects General Conditions of the Contract for Construction, Construction Manager as Advisor Edition, AIA Document A232 - 2019 Edition.

B. A copy of AIA Document A232 - 2019 Edition is bound into this Project Manual following this page

END OF SECTION

DRAFT

AIA® Document A232™ – 2019

General Conditions of the Contract for Construction,
Construction Manager as Adviser Edition

for the following PROJECT:
(Name, and location or address)

«Blank AIAs»
« »

THE CONSTRUCTION MANAGER:
(Name, legal status, and address)

« »« »
« »

THE OWNER:
(Name, legal status, and address)

« »« »
« »

THE ARCHITECT:
(Name, legal status, and address)

« »« »
« »

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A132™–2019, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132™–2019, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132™–2019, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents. The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract. The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and the Construction Manager or the Construction Manager's consultants, (3) between the Owner and the Architect or the Architect's consultants, (4) between the Contractor and the Construction Manager or the Construction Manager's consultants, (5) between the Owner and a Subcontractor or Sub-subcontractor (6) between the Construction Manager and the Architect, or (7) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their duties.

§ 1.1.3 The Work. The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project. The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by other Contractors, and by the Owner's own forces and Separate Contractors.

§ 1.1.5 Contractors. Contractors are persons or entities, other than the Contractor or Separate Contractors, who perform Work under contracts with the Owner that are administered by the Architect and Construction Manager.

§ 1.1.6 Separate Contractors. Separate Contractors are persons or entities who perform construction under separate contracts with the Owner not administered by the Architect and Construction Manager.

§ 1.1.7 The Drawings. The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.8 The Specifications. The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.9 Instruments of Service. Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.10 Initial Decision Maker. The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

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§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building

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Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Construction Manager and the Architect do not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work, and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements,

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assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities. Unless otherwise provided under the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 The Owner shall retain a construction manager adviser lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.4 If the employment of the Construction Manager or Architect terminates, the Owner shall employ a successor construction manager or architect to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

§ 2.3.5 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.6 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.7 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3.8 The Owner shall forward all communications to the Contractor through the Construction Manager. Other communication shall be made as set forth in Section 4.2.6.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to review by the Construction Manager and prior approval of the Architect, and the Construction Manager or Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Construction Manager's and Architect's and their respective consultants' additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction

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where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager or Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.5, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Construction Manager and Architect any nonconformity discovered by or made known to the Contractor as a request for information submitted to Construction Manager in such form as the Construction Manager and Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner, the Construction Manager, and the Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. The Construction Manager shall review the proposed alternative for sequencing, constructability, and coordination impacts on the other Contractors. Unless the Architect or the Construction Manager objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

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§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of the Project already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect, in consultation with the Construction Manager, and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner, Construction Manager, and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work or portions thereof provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices, and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Owner, assisted by the Construction Manager, shall secure and pay for the building permit. The Contractor shall secure and pay for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or

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(2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner, Construction Manager, and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect and Construction Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect, in consultation with the Construction Manager, determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner, Construction Manager, and Contractor, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner, Construction Manager, and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents:

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect, through the Construction Manager, of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor, stating whether the Owner, the Construction Manager, or the Architect (1) has reasonable objection to the proposed superintendent or (2) require additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner, Construction Manager, or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

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§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information, and the Construction Manager's use in developing the Project schedule, a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project. The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Contractors, or the construction or operations of the Owner's own forces or Separate Contractors.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Construction Manager's and Architect's approval. The Architect and Construction Manager's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Construction Manager and Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall participate with other Contractors, the Construction Manager, and the Owner in reviewing and coordinating all schedules for incorporation into the Project schedule that is prepared by the Construction Manager. The Contractor shall make revisions to the construction schedule and submittal schedule as deemed necessary by the Construction Manager to conform to the Project schedule.

§ 3.10.4 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner, Construction Manager, and Architect, and incorporated into the approved Project schedule.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Construction Manager, Architect, and Owner, and delivered to the Construction Manager for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data, and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect and Construction Manager is subject to the limitations of Sections 4.2.10 through 4.2.12. Informational submittals upon which the Construction Manager and Architect are not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Construction Manager, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract

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Documents, in accordance with the Project submittal schedule approved by the Construction Manager and Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Contractors, Separate Contractors, or the Owner's own forces. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples, and similar submittals with related documents submitted by other Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner, Construction Manager, and Architect, that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been reviewed and approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Construction Manager and Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Construction Manager and Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner, the Architect, and the Construction Manager shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Construction Manager shall review submittals for sequencing, constructability, and coordination impacts on other Contractors.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Construction Manager and Architect at the time and in the form specified by the Architect.

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§ 3.13 Use of Site

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner, Separate Contractors, or of other Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner, Separate Contractors, or by other Contractors except with written consent of the Construction Manager, Owner, and such other Contractors or Separate Contractors. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Separate Contractors, other Contractors, or the Owner, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner, or Construction Manager with the Owner's approval, may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner, Construction Manager, and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner, Construction Manager, and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner, Architect, or Construction Manager. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect through the Construction Manager.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, Architect, Construction Manager's and Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

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§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT AND CONSTRUCTION MANAGER

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 The Construction Manager is the person or entity retained by the Owner pursuant to Section 2.3.3 and identified as such in the Agreement.

§ 4.1.3 Duties, responsibilities, and limitations of authority of the Construction Manager and Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Construction Manager, Architect, and Contractor. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner's representatives during construction until the date the Architect issues the final Certificate for Payment. The Construction Manager and Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of the site visits, the Architect will keep the Owner and the Construction Manager reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner and Construction Manager known deviations from the Contract Documents and defects and deficiencies observed in the Work.

§ 4.2.3 The Construction Manager shall provide one or more representatives who shall be in attendance at the Project site whenever the Work is being performed. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner and Architect reasonably informed of the progress of the Work, and will promptly report to the Owner and Architect known deviations from the Contract Documents and the most recent Project schedule, and defects and deficiencies observed in the Work.

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Contractors in accordance with the latest approved Project schedule.

§ 4.2.5 The Construction Manager, except to the extent required by Section 4.2.4, and Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, and neither will be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of, or be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work.

§ 4.2.6 Communications. The Owner shall communicate with the Contractor and the Construction Manager's consultants through the Construction Manager about matters arising out of or relating to the Contract Documents. The Owner and Construction Manager shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Construction Manager otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with other Contractors shall be

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through the Construction Manager. Communications by and with the Owner's own forces and Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.7 The Construction Manager and Architect will review and certify all Applications for Payment by the Contractor, in accordance with the provisions of Article 9.

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents, and will notify each other about the rejection. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, upon written authorization of the Owner, whether or not the Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Section 4.2.8 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 Utilizing the submittal schedule provided by the Contractor, the Construction Manager shall prepare, and revise as necessary, a Project submittal schedule incorporating information from other Contractors, the Owner, Owner's consultants, Owner's Separate Contractors and vendors, governmental agencies, and participants in the Project under the management of the Construction Manager. The Project submittal schedule and any revisions shall be submitted to the Architect for approval.

§ 4.2.10 The Construction Manager will receive and promptly review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data, and Samples. Where there are other Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from the Contractor and other Contractors, and transmit to the Architect those recommended for approval. By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager's actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

§ 4.2.11 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.12 Review of the Contractor's submittals by the Construction Manager and Architect is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Construction Manager and Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Construction Manager and Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.13 The Construction Manager will prepare Change Orders and Construction Change Directives.

§ 4.2.14 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7, and the Architect will have authority to order minor changes in the Work as provided in Section 7.4. The Architect, in consultation with the Construction Manager, will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

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§ 4.2.15 Utilizing the documents provided by the Contractor, the Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Shop Drawings, Product Data, Samples, and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

§ 4.2.16 The Construction Manager will assist the Architect in conducting inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and receive and forward to the Owner written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment or final Project Application and Project Certificate for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

§ 4.2.17 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Construction Manager of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.18 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of the Construction Manager, Owner, or Contractor through the Construction Manager. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.19 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions so rendered in good faith.

§ 4.2.20 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.21 The Construction Manager will receive and review requests for information from the Contractor, and forward each request for information to the Architect, with the Construction Manager's recommendation. The Architect will review and respond in writing, through the Construction Manager, to requests for information about the Contract Documents. The Construction Manager's recommendation and the Architect's response to each request will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include other Contractors or Separate Contractors or the subcontractors of other Contractors or Separate Contractors.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Construction Manager, for review by the Owner, Construction Manager and Architect, of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Construction Manager may notify the Contractor whether the Owner, the Construction Manager or the Architect (1) has reasonable objection to any such proposed person or entity or, (2) requires additional time for review. Failure of the Construction Manager to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner, Construction Manager or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, that the Contractor, by these Contract Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- **.1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- **.2** assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor Contractor or other entity. If the Owner assigns the subcontract to a successor Contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor Contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction with Own Forces and to Award Other Contracts

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

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§ 6.1.2 When the Owner performs construction or operations with the Owner's own forces or Separate Contractors, the Owner shall provide for coordination of such forces and Separate Contractors with the Work of the Contractor, who shall cooperate with them.

§ 6.1.3 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner's own forces, Separate Contractors, Construction Manager and other Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner's own forces, Separate Contractors or other Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Construction Manager and Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor or other Contractors that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Construction Manager and the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's or other Contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractors or other Contractors that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs, including costs that are payable to a Separate Contractors or to other Contractors, because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of delays, improperly timed activities, damage to the Work or defective construction by the Owner's own forces, Separate Contractors, or other Contractors.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction, or to property of the Owner, Separate Contractors, or other Contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner, Separate Contractors, and other Contractors shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, other Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Construction Manager, with notice to the Architect, will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Construction Manager, Architect and Contractor. A Construction Change Directive requires agreement by the Owner, Construction Manager and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

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§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

A Change Order is a written instrument prepared by the Construction Manager and signed by the Owner, Construction Manager, Architect, and Contractor, stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Construction Manager and signed by the Owner, Construction Manager and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Construction Manager may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Construction Manager and Architect;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

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§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Construction Manager and Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Construction Manager and Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Construction Manager and Architect determine to be reasonably justified. The interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Construction Manager and Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Construction Manager shall prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Construction Manager and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Construction Manager that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner, Architect, Construction Manager, or an employee of any of them, or of the Owner's own forces, Separate Contractors, or other Contractors; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section

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15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts and the Architect, based on the recommendation of the Construction Manager, determines justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Construction Manager, before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Construction Manager and the Architect. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. The Construction Manager shall forward to the Architect the Contractor's schedule of values. Any changes to the schedule of values shall be submitted to the Construction Manager and supported by such data to substantiate its accuracy as the Construction Manager and the Architect may require, and unless objected to by the Construction Manager or the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner, Construction Manager or Architect require, such as copies of requisitions, and releases of waivers of lien from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Construction Manager and Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all

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Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 Where there is only one Contractor, the Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Certificate for Payment, in the full amount of the Application for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

§ 9.4.2 Where there is more than one Contractor performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives all of the Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Contractors; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Contractor's application with information from similar applications for progress payments from the other Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Contractors; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.2.1 Within seven days after the Architect receives the Project Application and Project Certificate for Payment and the Summary of Contractors' Applications for Payment from the Construction Manager, the Architect will either (1) issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager; or (2) issue to the Owner a Project Certificate for Payment for such amount as the Architect determines is properly due, and notify the Construction Manager and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Project Application for Payment, and notify the Construction Manager and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors.

§ 9.4.3 The Construction Manager's certification of an Application for Payment or, in the case of more than one Contractor, a Project Application and Certificate for Payment, shall be based upon the Construction Manager's evaluation of the Work and the data in the Application or Applications for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.4 The Architect's issuance of a Certificate for Payment or, in the case of more than one Contractor, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and data in the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is, or Contractors are, entitled to payment in the amount certified.

§ 9.4.5 The representations made pursuant to Sections 9.4.3 and 9.4.4 are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Construction Manager or Architect.

§ 9.4.6 The issuance of a Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality

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or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.3 and 9.4.4 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.2. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment or Project Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the acts and omissions described in Section 3.3.2 because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor or other Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect or Construction Manager withholds certification for payment under Section 9.5.1, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Construction Manager, and both will reflect such payment on the next Certificate for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment or Project Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Construction Manager and Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Construction Manager will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Owner, Construction Manager and Architect on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor

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fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner, Construction Manager nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, within fourteen days after the Construction Manager's receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Construction Manager and Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner, Construction Manager and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall notify the Construction Manager, and the Contractor and Construction Manager shall jointly prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the list, the Architect, assisted by the Construction Manager, will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect, assisted by the Construction Manager, to determine Substantial Completion.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work of all of the Contractors, or designated portion thereof, is substantially complete, the Construction Manager will prepare, and the Construction

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Manager and Architect shall execute, a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor and Construction Manager shall jointly prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect after consultation with the Construction Manager.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon completion of the Work, the Contractor shall forward to the Construction Manager a notice that the Work is ready for final inspection and acceptance, and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager shall perform an inspection to confirm the completion of Work of the Contractor. The Construction Manager shall make recommendations to the Architect when the Work of all of the Contractors is ready for final inspection, and shall then forward the Contractors' notices and Application for Payment or Project Application for Payment, to the Architect, who will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Construction Manager's and Architect's final Certificate for Payment or Project Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect through the Construction Manager (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6), if required by the Owner, other data

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establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect through the Construction Manager prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors. The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor;
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction; and
- **.4** construction or operations by the Owner, Separate Contractors, or other Contractors.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

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§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner, Construction Manager and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner, Construction Manager and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor, Construction Manager and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Construction Manager, Architect, their consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of

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tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Construction Manager and Construction Manager's consultants, and the Architect and Architect's consultants, shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice directly to the Owner, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the

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Contract Documents, the Owner shall inform both the Contractor and the Construction Manager, separately and in writing, prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice directly to the Contractor, and separately to the Construction Manager, of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Construction Manager and Construction Manager's consultants; (3) the Architect and Architect's consultants; (4) other Contractors and any of their subcontractors, sub-subcontractors, agents, and employees; and (5) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, other Contractors, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this Section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor, Architect, and Construction Manager for loss of use of the Owner's property, due to fire or other hazards however caused.

§ 11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to

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requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Construction Manager, Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Construction Manager, Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Construction Manager or Architect has not specifically requested to examine prior to its being covered, the Construction Manager or Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Construction Manager or Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion, and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner, Construction Manager or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

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§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner, Separate Contractors, or other Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Construction Manager, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become

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requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Construction Manager, Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Construction Manager and Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Construction Manager for transmittal to the Architect.

§ 13.4.5 If the Construction Manager or Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Construction Manager or Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Construction Manager has not certified or the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

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§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees, or any other persons performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, after consultation with the Construction Manager, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and the Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

- **.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of this Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- **.1** cease operations as directed by the Owner in the notice;
- **.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

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.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Construction Manager and Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost. If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

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§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties, the Construction Manager, and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation

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within 30 days of receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

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§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

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STATE OF DELAWARE DIVISION OF FACILITIES MANAGEMENT

SUPPLEMENTARY GENERAL CONDITIONS A232-2019

The following supplements modify the "General Conditions of the Contract for Construction, Construction Manager as Advisor Edition." AIA Document A232-2019. Where a portion of the General Conditions is modified or deleted by the Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

TABLE OF ARTICLES

1. GENERAL PROVISIONS
2. OWNER
3. CONTRACTOR
4. ARCHITECT AND CONSTRUCTION MANAGER
5. SUBCONTRACTORS
6. CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
7. CHANGES IN THE WORK
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9. PAYMENTS AND COMPLETION
10. PROTECTION OF PERSONS AND PROPERTY
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14. TERMINATION OR SUSPENSION OF THE CONTRACT
15. CLAIMS AND DISPUTES

STATE OF DELAWARE DIVISION OF FACILITIES MANAGEMENT

ARTICLE 1: GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

Delete the last sentence in its entirety and replace with the following:

"The Contract Documents also include Advertisement for Bid, Instructions to Bidder, sample forms, the Bid Form, the Contractor's completed Bid and the Award Letter."

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following Paragraphs:

1.2.4 In the case of an inconsistency between the Drawings and the Specifications, or within either document not clarified by addendum, the better quality or greater quantity of work shall be provided in accordance with the Architect's interpretation.

1.2.5 The word "PROVIDE" as used in the Contract Documents shall mean "FURNISH AND INSTALL" and shall include, without limitation, all labor, materials, equipment, transportation, services and other items required to complete the Work.

1.2.6 The word "PRODUCT" as used in the Contract Documents means all materials, systems and equipment.

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

Delete Paragraph 1.5.1 in its entirety and replace with the following:

"All pre-design studies, drawings, specifications and other documents, including those in electronic form, prepared by the Architect under this Agreement are, and shall remain, the property of the Owner whether the Project for which they are made is executed or not. As for the Project for which the Architect is hired, the Architect still remain liable for any claim relating to the design that arises from the Project.

However, such documents may be used by the Owner to construct one or more like projects without the approval of, or additional compensation to, the Architect. The Contractor, Subcontractors, Sub-subcontractors and Material or Equipment Suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants appropriate to and for use in the execution of their Work under the Contract Documents. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or Material and Equipment Supplier on other Projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and Architect's consultants.

The Architect shall not be liable for injury or damage resulting from the re-use of drawings and specifications if the Architect is not involved in the re-use Project."

1.6 NOTICE

1.6.1 Insert the following sentence at the end of the paragraph:

"Electronic mail, also known as email, is an acceptable form of electronic transmission of notices under this Agreement."

ARTICLE 2: OWNER

2.1 General

2.1.2 Delete Paragraph 2.1.2 in its entirety.

2.2 EVIDENCE OF OWNER'S FINANCIAL ARRANGEMENT

2.2.1 Delete the second sentence in this paragraph and replace with the following: "The Contractor shall have no obligation to commence the Work until the Owner issues a Purchase Order for the Project."

2.2.2 Delete the last three sentences in this paragraph.

ARTICLE 3: CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.4 Delete the third sentence in Paragraph 3.2.4.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

Add the following Paragraphs:

3.3.2.1 The Contractor shall immediately remove from the Work, whenever requested to do so by the Owner, any person who is considered by the Owner or Architect to be incompetent or disposed to be disorderly, or who for any reason is not satisfactory to the Owner, and that person shall not again be employed on the Work without the consent of the Owner or the Architect.

3.3.4 The Contractor must provide suitable storage facilities at the Site, or an alternative site as approved by the Owner, for the proper protection and safe storage of their materials. Consult the Owner and the Architect before storing any materials.

3.3.5 When any room is used as a shop, storeroom, office, etc., by the Contractor or Subcontractor(s) during the construction of the Work, the Contractor making use of these areas will be held responsible for any repairs, patching or cleaning arising from such use.

3.4 LABOR AND MATERIALS

3.4.1.1 Add a new section 3.4.1.1:

"The Contractor, at their expense shall bear the costs to accurately identify the location of all underground utilities in the area of their excavation and shall bear all cost for any repairs required, out of failure to accurately identify said utilities."

Add the Following Paragraphs:

3.4.4 Before starting the Work, each Contractor shall carefully examine all preparatory Work that has been executed to receive their Work. Check carefully, by whatever means are required, to insure that its Work and adjacent, related Work, will finish to proper contours, planes and levels. Promptly notify the General Contractor/Construction Manager of any defects or imperfections in preparatory Work which will in any way affect satisfactory completion of its Work. Absence of such notification will be construed as an acceptance of preparatory Work and later claims of defects will not be recognized.

3.4.5 Under no circumstances shall the Contractor's Work proceed prior to preparatory Work having been completely cured, dried and/or otherwise made satisfactory to receive this Work. Responsibility for timely installation of all materials rests solely with the Contractor responsible for that Work, who shall maintain coordination at all times.

3.5 WARRANTY

Add the following Paragraphs:

3.5.3 The Contractor will warrant all materials and workmanship against original defects, except injury from proper and usual wear when used for the purpose intended, for two years after Substantial Completion of the project in accordance with Section 9.8.4 of this Agreement, and will maintain all items in condition that conforms with the Contract Documents during the period of warranty.

3.5.4 Non-conforming work during the period of warranty will be corrected by the Contractor at its expense upon demand of the Owner, it being required that the Work conforms to the Contract Documents at the expiration of the warranty period.

3.5.5 In addition to the General Warranty there are other warranties required for certain items for different periods of time than the two years as above and are particularly so stated in that part of the specifications referring to same. The said warranties will commence at the same time as the General Warranty.

3.5.6 If the Contractor fails to remedy any failure, defect or damage within a reasonable time after receipt of notice, the Owner will have the right to replace, repair, or otherwise remedy the failure, defect or damage at the Contractor's expense.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

Add the following Paragraphs:

3.11.1 During the course of the Work, the Contractor shall maintain a record set of drawings on which the Contractor shall mark the actual physical location of all piping, valves, equipment, conduit, outlets, access panels, controls, actuators, including all appurtenances that will be concealed once construction is complete, etc., including all invert elevations.

3.11.2 At the completion of the project, the Contractor shall obtain a set of reproducible drawings from the Architect, and neatly transfer all information outlined in 3.11.1 to provide a complete record of the as-built conditions.

3.11.3 The Contractor shall provide two (2) prints of the as-built conditions, along with the reproducible drawings themselves, to the Owner and one (1) set to the Architect. In addition, attach one complete set to each of the Operating and Maintenance Instructions/Manuals. Provide the same information in digital format.

3.15 CLEANING UP

3.15.2 Strike sentence in its entirety and replace with the following:

"If the Contractor fails to clean up as provided in the Contract Documents, the Owner, or Construction Manager with the Owner's approval, may do so and the Owner shall withhold the amount that reflects the cost of the cleanup from any moneys owed the Contractor. If the cost of cleanup exceeds the moneys owed to the Contractor, the Owner shall be entitled to reimbursement from the Contractor for the amount exceeding what is withheld.

3.17 In the second sentence of 3.17, insert "indemnify and" between "shall" and "hold".

ARTICLE 4: ARCHITECT AND CONSTRUCTION MANAGER

4.2 Administration of the Contract

Delete the first sentence of Paragraph 4.2.11 and replace with the following:

The Architect will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples for the purpose of checking for conformance with the Contract Documents.

Delete the second sentence of Paragraph 4.2.11 and replace with the following:

The Architect's action will be taken with such reasonable promptness as to cause no delay in the Work in the activities of the Owner, Contractor or separate Contractors, while allowing sufficient time in the Owner's professional judgment to permit adequate review.

Add the following to Paragraph 4.2.17:

There will be no full-time Project representative provided by the Owner or Architect on site for this Project.

Add to Paragraph 4.2.20 “and in compliance with all applicable codes, regulations and ordinances.” to the end of the sentence.

ARTICLE 5: SUBCONTRACTORS

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

Delete Paragraph 5.2.3 in its entirety and replace with the following:

5.2.3 If the Owner, Architect or Construction Manager has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Architect or Construction Manager has no reasonable objection, subject to the statutory requirements of 29 Delaware Code § 6962(d)(10)b.3 and 4.

ARTICLE 6: CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER’S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

6.1.1 Delete “and waiver of subrogation” from the last sentence.

6.1.3 Delete Paragraph 6.1.3 in its entirety and replace with the following:

“When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term “Contractor” in the Contract Documents in each case shall mean the Constructor who executes each separate Owner-Contractor Agreement.”

6.2 MUTUAL RESPONSIBILITY

6.2.3 In the second sentence, strike the word “shall” and insert the word “may”.

ARTICLE 7: CHANGES IN THE WORK

(SEE ARTICLE 7: CHANGES IN WORK IN THE GENERAL REQUIREMENTS)

ARTICLE 8: TIME

8.2 PROGRESS AND COMPLETION

Add the following Paragraphs:

8.2.1.1 Refer to Specification Section CONSTRUCTION SCHEDULE for Contract time requirements.

8.2.4 If the Work falls behind the Progress Schedule as submitted by the Contractor, the Contractor shall employ additional labor and/or equipment necessary to

bring the Work into compliance with the Progress Schedule at no additional cost to the Owner.

8.3 DELAYS AND EXTENSION OF TIME

8.3.1 Strike “binding dispute resolution” and insert “remedies at law or in equity”.

Add the following Paragraph:

8.3.2.1 The Contractor shall update the status of the suspension, delay, or interruption of the Work with each Application for Payment. (The Contractor shall report the termination of such cause immediately upon the termination thereof.) Failure to comply with this procedure shall constitute a waiver for any claim for adjustment of time or price based upon said cause.

Delete Paragraph 8.3.3 in its entirety and replace with the following:

8.3.3 Except in the case of a suspension of the Work directed by the Owner, an extension of time under the provisions of Paragraph 8.3.1 shall be the Contractor’s sole remedy in the progress of the Work and there shall be no payment or compensation to the Contractor for any expense or damage resulting from the delay.

Add the following Paragraph:

8.3.4 By permitting the Contractor to work after the expired time for completion of the project, the Owner does not waive its rights under the Contract.

8.3.5 The parties agree that Paragraph 8.3.3 of the Supplementary General Conditions does not apply to the Construction Manager in the event of a delay caused by a party other than the Construction Manager.

ARTICLE 9: PAYMENTS AND COMPLETION

9.1 CONTRACT SUM
9.1.2 Strike Section 9.1.2 in its entirety.

9.2 SCHEDULE OF VALUES

Add the following Paragraphs:

9.2.1 The Schedule of Values shall be submitted into Building Blok (EDiS’ web-based project management software, using AIA Document G702, Continuation Sheet to G703.

9.3 APPLICATIONS FOR PAYMENT

Add the following Paragraph:

9.3.1.3 Application for Payment shall be submitted into Building Blok (EDiS’ web-based project management software, on AIA Document G702 “Application and

Certificate for Payment", supported by AIA Document G703 "Continuation Sheet". Said Applications shall be fully executed and notarized.

Add the following Paragraphs:

9.3.4 Until Closeout Documents have been received and outstanding items completed the Owner will pay 95% (ninety-five percent) of the amount due the Contractor on account of progress payments.

9.3.5 The Contractor shall provide a current and updated Progress Schedule to the Architect with each Application for Payment. Failure to provide Schedule will be just cause for rejection of Application for Payment.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

Add the following to 9.5.1:

.8 failure to provide a current Progress Schedule;
.9 a lien or attachment is filed;
.10 failure to comply with mandatory requirements for maintaining Record Documents.

9.6 PROGRESS PAYMENTS

Delete Paragraph 9.6.1 in its entirety and replace with the following:

9.6.1 After the Architect and the Construction Manager have approved and issued a Certificate for Payment, payment shall be made by the Owner within 45 days after Owner's receipt of the Certificate for Payment.

9.6.8 Strike "Provided the Owner has fulfilled its payment obligations under the Contract Documents, the" and replace with "The".

9.7 FAILURE OF PAYMENT

In first sentence, strike the first reference to "seven" and insert "forty-five (45)". Also strike "binding dispute resolution" and insert "remedies at law or in equity".

9.8 SUBSTANTIAL COMPLETION

9.8.5 In the second sentence, strike "shall" and insert "may".

ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

Add the following Paragraphs:

10.1.1 Each Contractor shall develop a safety program in accordance with the Occupational Safety and Health Act of 1970. A copy of said plan shall be furnished to the Owner and Architect prior to the commencement of that Contractor's Work.

10.1.2 Each Contractor shall appoint a Safety Representative. Safety Representatives shall be someone who is on site on a full-time basis. If deemed necessary by the Owner or Architect, Contractor Safety meetings will be scheduled. The attendance of all Safety Representatives will be required. Minutes will be recorded of said meetings by the Contractor and will be distributed to all parties as well as posted in all job offices/trailers etc.

10.2 SAFETY OF PERSONS AND PROPERTY

Add the following Paragraph:

10.2.4.1 As required in the Hazardous Chemical Act of June 1984, all vendors supplying any material that may be defined as hazardous must provide Material Safety Data Sheets for those products. Any chemical product should be considered hazardous if it has a caution warning on the label relating to a potential physical or health hazard, if it is known to be present in the workplace, and if employees may be exposed under normal conditions or in foreseeable emergency situations. Material Safety Data Sheets shall be provided directly to the Owner or its designee, along with the shipping slips that include those products.

10.3 HAZARDOUS MATERIALS

Delete Paragraph 10.3.3 in its entirety.

Delete Paragraphs 10.3.6 in its entirety.

ARTICLE 11: INSURANCE AND BONDS

11.1 CONTRACTOR'S INSURANCE AND BONDS

11.1.1 Strike "Owner," at the beginning of the third sentence.

11.1.2 Add the following sentence at the end of the paragraph: "The bonds will conform to those forms approved by the Office of Management and Budget."

11.2 OWNER'S INSURANCE

Delete Paragraph 11.2 in its entirety and replace with the following:

11.2 The Owner will not provide Builder's All Risk Insurance for the Project. The Construction Manager will provide Builder's All Risk Insurance for the Project. The Contractor and all Subcontractors shall provide coverage for materials, fixtures and/or equipment being used in the construction or renovation of a building or structure should those items sustain physical loss or damage from a covered cause. Any mandatory deductible required by the Contractor's Insurance shall be the responsibility of the Contractor.

11.3 WAIVERS OF SUBROGATION

Delete Paragraph 11.3 and its subparagraphs in their entirety.

11.4 LOSS OF USE, BUSINESS INTERRUPTION, AND DELAY IN COMPLETION INSURANCE

Delete Paragraph 11.4 in its entirety.

11.5 ADJUSTMENT AND SETTLEMENT OF INSURED LOSS

Delete Paragraph 11.5 in its entirety.

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

12.2.2 AFTER SUBSTANTIAL COMPLETION

12.2.2.1 In the first sentence, strike “within one year after the date of Substantial Completion of the Work or designated portion thereof” and replace with “within two years after the date of Substantial Completion of the Project in accordance with Section 9.8.4 of this Agreement or designated portion thereof”.

12.2.2.1 In the third sentence of the paragraph, strike “one year period” and replace it with “two year period”.

Add the following Paragraph:

12.2.2.1.1 At any time during the progress of the Work, or in any case where the nature of the defects will be such that it is not expedient to have corrected, the Owner, at its option, will have the right to deduct such sum, or sums, of money from the amount of the Contract as it considers justified to adjust the difference in value between the defective work and that required under contract including any damage to the structure.

12.2.2.2 Strike “one” and insert “two”.

12.2.2.3 Strike “one” and insert “two”.

12.2.5 In second sentence, strike “one” and insert “two”.

ARTICLE 13: MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

13.1 Strike the second sentence in its entirety.

13.5 INTEREST

13.5 Strike 13.5 in its entirety and replace with the following:
"Payments are due 45 days after receipt of a valid Application for Payment. After that 30 day period, interest may be charged at the rate of 1% per month not to exceed 12% per annum."

Add the following Paragraph:

13.6 CONFLICTS WITH FEDERAL STATUTES OR REGULATIONS

13.6.1 If any provision, specifications or requirement of the Contract Documents conflict or is inconsistent with any statute, law or regulation of the government of the United State of America, the Contractor shall notify the Architect and Owner immediately upon discovery.

ARTICLE 14: TERMINATION OR SUSPENSION OF THE CONTRACT

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

Delete Paragraph 14.4.3 in its entirety and replace with the following:

14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and cost incurred by reason of such termination along with reasonable overhead.

ARTICLE 15: CLAIMS AND DISPUTES

15.1.2 TIME LIMITS ON CLAIMS.

15.1.2 Strike "in accordance with the requirements of the binding dispute resolution method selected in the Agreement and" from the first sentence.
Strike the second sentence in its entirety.

15.1.4 CONTINUING CONTRACT PERFORMANCE

15.1.4.2 Strike in its entirety.

15.1.7 CLAIMS FOR CONSEQUENTIAL DAMAGES

Delete Paragraph 15.1.7 and its subparagraphs in their entirety.

15.2 INITIAL DECISION

15.2.1 Delete "and binding dispute resolution"

15.2.5 Delete in its entirety and replace with the following:

15.2.5 The Architect will approve or reject Claims by written decision, which shall state the reasons therefore and shall notify the parties of any change in the Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Architect shall be subject to mediation and other remedies at law or in equity.

Delete Paragraph 15.2.6 and its subparagraphs in their entirety.

15.3 MEDIATION

15.3.1 Strike “binding dispute resolution” and insert “any or all remedies at law or in equity”.

15.3.2 In the first sentence, delete “administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedure in effect on the date of the Agreement,”. Also strike “binding dispute resolution” and insert “remedies at law and in equity”.

15.3.3 Strike in its entirety.

15.4 ARBITRATION

Delete Paragraph 15.4 and its subparagraphs in their entirety.

END OF SUPPLEMENTARY GENERAL CONDITIONS

SECTION 007343 – WAGE RATE REQUIREMENTS

1. SUMMARY

A. In accordance with Delaware Code, Title 29, Subchapter IV, Section 6960, all laborers and mechanics of the Contractor and all subcontractors employed to perform work directly upon the site of the work shall be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account the full amounts accrued at the time of payment computed at wage rates not less than those determined by the Division of Industrial Affairs, Department of Labor, State of Delaware, as the prevailing rates in this area.

B. This approved scale of wages must be posted by the Contractor in a prominent and easily accessible place at the site of the work.

C. It is further stipulated that there may be withheld from the Contractor such accrued payment as may be considered necessary by the contracting officer to pay laborers and mechanics employed by the Contractor or any subcontractors on the work the difference between the rates of wages required and the rate of wages received by such laborers and mechanics and not refunded to the Contractor, subcontractor or their agents.

D. Where wage rates are published in this Manual they are issued by the State Department of Labor on the date indicated and are included for the convenience of Bidders. The Owner, the Architect, and the Construction Manager, accept no responsibility for the accuracy or applicability of any rates included herein. The actual wage rate determinations which will apply to the work will be those in effect on the first day of public advertisement for bids as determined by the State Department of Labor. It will be the responsibility of each bidder to contact the State Department of Labor and to incorporate these rates in his bid.

E. In accordance with Delaware Code, Title 29, Subchapter IV, Section 6960, as amended January 11, 2024, contractors shall furnish sworn payroll information to the Department of Labor on a weekly basis for each contract which exceeds $45,000 for renovation work and/or $500,000 for new construction. The construction contract amount is based on a cumulative total of all contracts bid for a specific project. Payroll forms for submission may be obtained from the Department of Labor.

1. A Payroll Report, available from the Department of Labor is to be used to provide this information.

F. A copy of the Prevailing Wages for the project is attached hereto.

END OF SECTION

SECTION 008114 – DRUG TESTING PROGRAM AND FORMS

1. SUMMARY

A. Pursuant to 4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors who work on Large Public Works Contracts funded all or in part with public funds submit with their bid an Affidavit of Employee Drug Testing Program. A copy of the current Regulation is attached hereto.

B. Each Contractor shall provide two (2) business days prior to contract execution, copies of the Employee Drug Testing Program for the Contractor and all Subcontractors.

C. Initial Drug Testing - Employees commencing work on a Jobsite must be tested within the past 180 days from the date of commencing work, with the exception that an Employee who has passed a random or scheduled drug test within that time frame, or an Employee who passed a pre-employment drug test administered pursuant to a Contractor's or Subcontractor's Program and is subject to testing as part of a Contractor's or Subcontractor's ongoing Program or as part of a Consortium shall be permitted to work at the Jobsite without further testing; however, the Employee is still subject to random testing.

D. A Contractor or Subcontractor's Program shall provide that no less than 5% of a Contractor's or Subcontractor's employees shall be randomly selected each month for drug testing and no less than 2.5% of a Contractor or Subcontractor's employees be randomly selected for alcohol testing. Test results must be kept by a Contractor or Subcontractor for a minimum of 1 year subsequent to the date of close out of the Public Works project. See the form attached hereto.

E. The Contractor will notify the Owner in writing of any positive results of random drug testing. See the form attached hereto. The results must be reported to the Owner within 24 hours of receipt of the test results.

EMPLOYEE DRUG TESTING REPORT FORM
Period Ending:_____

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors who work on Large Public Works Contracts funded all or in part with public funds maintain testing data that includes but is not limited to the data elements below.

Project Number: _____

Project Name: _____

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Number of employees who worked on the jobsite during the report period:_____

Number of employees subject to random testing during the report period:_____

Number of Negative Results_____Number of Positive Results _____

Action taken on employee(s) in response to a failed or positive random test:

_____

_____

_____

Authorized Representative of Contractor/Subcontractor: _____
(typed or printed)

Authorized Representative of Contractor/Subcontractor: _____
(signature)

Date: _____

This form is not required to be submitted to the Owner. Included as a reference to show information required to be maintained by the Contractor. The Owner shall have the right to periodically audit all Contractor and Subcontractor test results at the Contractor's or Subcontractor's offices (or by other means to make the data available for inspection by the Owner).

EMPLOYEE DRUG TESTING
REPORT OF POSITIVE RESULTS

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors who work on Large Public Works Contracts funded all or in part with public funds to notify the Owner in writing of a positive random drug test.

Project Number: _____

Project Name: _____

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Name of employee with positive test result:_____

Last 4 digits of employee SSN:_____

Date test results received:_____

Action taken on employee in response to a positive test result:

_____

_____

_____

Authorized Representative of Contractor/Subcontractor: _____
(typed or printed)

Authorized Representative of Contractor/Subcontractor: _____
(signature)

Date: _____

This form shall be sent by mail to the Owner within 24 hours of receipt of test results.

Enclose this test results form in a sealed envelope with the notation "Drug Testing Form – DO NOT OPEN" on the face thereof and place in a separate mailing envelope.

END OF SECTION

OFFICE OF MANAGEMENT AND BUDGET
DIVISION OF FACILITIES MANAGEMENT
4000 Office of Management and Budget
4100 Division of Facilities Management

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects

1.0 Purpose

The Office of Management and Budget ("Office"), has developed these regulations that require contractors and subcontractors to implement a program of mandatory drug testing for employees who work on large public works contracts funded all or in part with public funds pursuant to 29 **Del.C.** §6908(a)(6). The regulations establish the mechanism, standards and requirements of a Mandatory Drug Testing Program that will be incorporated by reference into all large public works contracts awarded pursuant to 29 **Del.C.** §6962.

2.0 Definitions

"**Consortium"/"third party administrator**" or "**(C/TPA)**" means a service agent that provides or coordinates the provision of a variety of drug and alcohol testing services to employers. C/TPAs typically perform administrative tasks concerning the operation of the employers' drug and alcohol testing programs. This term includes, but is not limited to, groups of employers who join together to administer, as a single entity, the drug and alcohol testing programs of its members.

"**Contractor**" means an entity such as, but not limited to, an individual, firm, partnership or corporation that has a contractual obligation to perform work for contracts awarded pursuant to 29 **Del.C.** §6962.

"**Division of Facilities Management**" and "**DFM**" means the Division of Facilities Management within the Office of Management and Budget.

"**Drug testing firm**" is an entity engaged in the business of providing drug testing services for businesses, individuals, governments or any entity that requires drug testing of employees, applicants, licensees, etc., in compliance with these requirements.

"**Employee**" means an individual employed by a contractor or subcontractor who works on the jobsite of a large public works contract but does not fulfill a clerical or administrative function. For the purpose of this definition, clerical or administrative functions shall refer to job responsibilities that do not generally require an employee to work outside of the contractor's jobsite office, home office or other employer-provided office. For the purposes of this regulation, the term "employee" shall also include supervisors and foremen working on the jobsite. The term "employee" shall also include employees of a contractor or subcontractor working on or delivering materials and equipment to and from a jobsite.

"**Impairment**" or "**impaired**" means symptoms that an employee while working may be under the influence of drugs or alcohol that may decrease or lessen the employee's performance of the duties or tasks of the employee's job position, including symptoms of the employee's speech, walking, standing, physical dexterity, agility, coordination, actions, movement, demeanor, appearance, clothing, odor, irrational or unusual behavior, negligence or carelessness in operating equipment, machinery or production or manufacturing processes, disregard for the safety of the employee or others, or other symptoms causing a reasonable suspicion of the use of drugs or alcohol.

"Jobsite" means the site or area directly or indirectly owned, operated or controlled by the owner in which the contractor or subcontractor performs work or delivers services to the owner. For the purpose of this definition, "jobsite" does not mean a remote work site not under the direct or indirect control of the owner in which work is performed to fulfill the contractor's or subcontractor's obligations.

"Large public works contract" means a contract for a public works construction awarded pursuant to 29 **Del.C.** §6962.

"Mandatory drug testing program" and "**program**" means a defined set of basic procedures, requirements and rules that must be used by a contractor or subcontractor to test employees for drugs in compliance with these requirements.

"Owner" is the state agency, school district or entity that awards a large public works contract to a contractor pursuant to 29 **Del.C.** §6962.

"Positive test result" and "**fail a drug test**" means the result reported by a Health and Human Services certified laboratory when a specimen contains a drug or drug metabolite equal to or greater than the cutoff concentration. For purposes of these regulations, an employee shall not be considered to have a positive test result nor shall an employee be considered to "fail a drug test", unless the employee was impaired by marijuana at the jobsite if:

- The employee is a registered qualifying patient and;
- The drug detected was marijuana, a component of marijuana, or marijuana metabolites.

"Random drug testing" means that an employee is chosen at random for testing without advance notice, from a pool of employees or as a member of a consortium. Specific requirements for random drug testing conducted under these regulations are described in Section 5.0.

"Registered qualifying patient" means a person (1) validly issued and in possession of an unexpired registry identification card as defined by 16 **Del.C.** §4902A (14), and (2) subject to confirmation through a "verification system" as set forth at 16 **Del.C.** §4902A(17).

"Subcontractor" means an entity such as, but not limited to, an individual, firm, partnership or corporation that has a contractual obligation to perform work for, or supply services to a contractor as defined in Section 2.0.

21 DE Reg. 503 (12/01/17)

3.0 Employee Drug Testing Documentation Requirements

3.1 The following documentation requirements apply:

3.1.1 At bid submission. A solicitation for a large public works contract must require each contractor that submits a bid for the work to submit with the bid a signed affadavit certifying that the contractor and subcontractor(s) has in place or will implement during the entire term of the contract a mandatory drug testing program that complies with this regulation.

3.1.2 At least 2 business days prior to contract execution. The awarded contractor shall provide to the owner copies of the employee drug testing program for the contractor and for all listed subcontractors.

3.1.3 During contract execution. Contractors that employ additional subcontractors on the jobsite may do so only after submitting a copy of the subcontractor's employee drug testing program. A contractor or subcontractor shall not commence work until the owner has concluded the employee drug testing program complies with this regulation as per subsection 3.2.

3.1.4 In the event of an emergency a contractor may employ additional subcontractors on the jobsite prior to submitting the subcontractor's employee drug testing program provided that said program is submitted to the owner as soon as practicable.

3.2 A contractor or subcontractor shall be treated as having a mandatory drug testing program that complies with this regulation if the program includes the following:

3.2.1 The program meets the minimum standards in Section 4.0 of this regulation.

3.2.2 The program provides for the frequency of testing of employees as per Section 5.0 of this regulation:

3.2.3 The program imposes disciplinary measures on an employee who fails a drug test as per Section 6.0 of this regulation.

3.3 Prequalified contractors and subcontractors. A contractor or subcontractor may meet the provisions of subsection 3.1 if they are prequalified through the DFM prequalification and if the DFM prequalification includes provisions requiring an employee mandatory drug testing program that meet the requirements of Sections 4.0, 5.0 and 6.0 of this regulation

3.4 The State shall not be obligated to pay, and the contractor or subcontractor shall expressly agree that, any portion of work performed by a contractor or subcontractor commenced before that contractor or subcontractor has complied with subsections 3.1 and 3.2, provided however that emergency work as referenced in subsection 3.1.4 may not be subject to this provision.

21 DE Reg. 503 (12/01/17)

4.0 Minimum Standards for a Mandatory Drug Testing Program

4.1 Testing for the presence of drugs in an employee's system and the handling of test specimens shall be conducted in accordance with guidelines for the collection, chain-of-custody procedures, laboratory testing, and Medical Officer Review procedures contained within the Mandatory Guidelines for Federal Workplace

Drug Testing Programs published by the Substance Abuse and Mental Health Services Administration (SAMHSA). (49 CFR Part 40).

All tests must be processed by a federal Health and Human Services certified laboratory. Contractors must provide documentation detailing the procedures used in the collection, testing and reporting of drug tests sufficient to show conformance with SAMHSA guidelines.

4.2 Contractors and subcontractors subject to these regulations may procure the services of an appropriate drug testing firm to administer their program. A contractor or subcontractor may also participate in a consortium. A contractor or subcontractor may also implement a mandatory drug testing program using in-house personnel and resources.

4.3 Employees subject to drug testing shall be tested using at a minimum a seven-panel protocol testing plus alcohol screening for the following:

Initial test analyte	**Initial test cutoff concentration**	**Confirmatory test analyte**	**Confirmatory test cutoff concentration**
Marijuana metabolites	50 ng/mL	THCA	15 ng/mL.
Cocaine metabolites	150 ng/mL	Benzoylecgonine	100 ng/mL.
Opiate metabolites			
Codeine/Morphine	2000 ng/mL	Codeine	2000 ng/mL.
		Morphine	2000 ng/mL.
6-Acetylmorphine	10 ng/mL	6-Acetylmorphine	10 ng/mL.
Phencyclidine	25 ng/mL	Phencyclidine	25 ng/mL.
Amphetamines			
AMP/MAMP	500 ng/mL	Amphetamine	250 ng/mL.
		Methamphetamine	250 ng/mL.
MDMA	500 ng/mL	MDMA	250 ng/mL.
		MDA	250 ng/mL.
		MDEA	250 ng/mL.
Alcohol	0.04%		

4.4 The frequency of random drug testing and the methodology for selecting employees to be screened are defined in Section 5.0 and shall be incorporated into contractor and subcontractor mandatory testing procedures. A contractor or subcontractor may incorporate rules or requirements that exceed the requirements defined herein.

21 DE Reg. 503 (12/01/17)

5.0 Drug Testing Requirements – Frequency for the Testing of Employees

5.1 Initial drug testing. Employees commencing work on a jobsite must be tested with the exception that an employee who has passed a random or scheduled drug test within the past 180 days from the date of commencing work or an employee who passed a pre-employment drug test administered pursuant to an contractor's or subcontractor's program, or who possesses a certification no more than 6 months old under the then current New Castle County ordinance 2.05.305 - Alcohol and Drug Testing of Employees of Contractors Working on Public Works Projects and Jobsites, and is subject to testing as part of a contractor's or subcontractor's ongoing program or as part of a consortium shall be permitted to work at the jobsite without further testing; however, the employee is still subject to random testing.

5.2 Random drug testing. During the course of a project, each contractor and subcontractor with employees on the jobsite shall maintain a program that meets or exceeds the following requirements.

5.2.1 All employees will be subject to random, unannounced testing.

5.2.2 The selection of employees shall be made by a scientifically valid method of randomly generating an employee identifier from a contractor or subcontractor’s entire pool of employees, through those employees working on a public works jobsite or through the contractor or subcontractor's participation in a consortium.

5.2.3 A contractor or subcontractor's program shall provide that no less than 5% of a contractor’s or subcontractor’s employees shall be randomly selected each month for drug testing and no less than 2.5% of a contractor or subcontractor's employees be randomly selected for alcohol testing. Contractors or

subcontractors may participate in a consortium provided that no less than 5% of the consortium's pool shall be subject to drug testing each month and no less than 2.5% of the consortium's pool shall be subject to alcohol testing each month. Contractors or subcontractors with less than 10 employees that do not participate in a consortium shall test at least 1 of their employees, selected randomly per month. Each employee shall have an equal chance of selection each time the selection is made. Because the selection process is random, some employees may not be tested within a year, while others may be tested more than once. Nothing in this regulation shall require an employee of a contractor or subcontractor not working or assigned to a public works jobsite to be subject to random alcohol testing.

5.2.4 Employees notified that they have been selected must report within 4 hours for testing to a site specified. Employees so notified must have been given such notification at least 4 hours before the scheduled closing time of the testing facility. Any failure to report for random testing, or to cooperate with the testing procedure shall be considered a positive result.

5.2.5 Purposely impeding or delaying an employee's fulfillment of the testing requirements herein by a contractor or subcontractor may subject the contractor or subcontractor to sanctions listed in Section 8.0.

5.3 Reasonable suspicion testing. An employee will be required to take a drug and/or alcohol test at any time his or her employing contractor, subcontractor or the owner reasonably believes that he or she has an impairment caused by drugs and/or alcohol. Further, an employee may be required to take a drug and/or alcohol test at any time his or her employing contractor, subcontractor or the owner finds drug paraphernalia and/or open alcohol containers on the jobsite.

5.4 Return to duty testing. As required in Section 6.0.

5.5 Accident triggered testing. An employee will be required to take a drug test and may be subject to an alcohol breathalyzer test at any time there is a jobsite accident involving loss or significant property damage, injury or death to an employee of the contractor, subcontractor, or owner or member of the public.

5.5.1 As soon as practicable following an accident, the contractor will notify the employee(s) whose performance could have contributed to the accident of the need for the test.

5.5.2 The appropriate contractor shall ensure that an employee, required to be tested under this section, report to a testing center as soon as practicable, but no longer than 4 hours after the accident. Employees so notified must have been given such notification at least 4 hours before the scheduled closing time of the testing facility. If the drug test is not conducted within 4 hours, attempts to conduct the test must cease and the reasons for the failure to test documented.

5.5.3 An employee who is subject to post-accident testing who fails to remain readily available for such testing, including notifying a supervisor of his or her location if he or she leaves the scene of the accident prior to submission to such test, may be deemed to have refused to submit to testing.

5.5.4 If an employee fails or refuses to be tested, he/she must be removed from the jobsite and shall be subject to consequences in Section 6.0.

5.5.5 Nothing in this section shall be construed to require the delay of necessary medical attention for the injured following an accident, or to prohibit an employee from leaving the scene of an accident for the period necessary to obtain assistance in responding to the accident, or to obtain necessary emergency medical care.

5.6 All testing required by this section shall be administered according to the standards outlined in Section 4.0.

21 DE Reg. 503 (12/01/17)

28 DE Reg. 228 (09/01/24)

6.0 Consequences of a Positive Test Result

6.1 The disciplinary measures contained within a contractor's or subcontractor's program for an employee who tests positive to a mandatory drug test must include at a minimum, all of the following:

6.1.1 The employee is subject to an immediate suspension from any public works jobsite.

6.1.2 The employee is not eligible for reinstatement by the contractor or subcontractor to any public works jobsite until 30 days after the employee tests negative on a seven drug panel plus alcohol test certified by a medical review officer.

6.1.3 The employee is subject to unscheduled monthly random testing as per subsection 5.2.

6.1.4 An employee who has tested positive for more than 1 drug test within a 3-year period shall be permanently banned from working at public works jobsites.

6.1.5 An employee who has tested positive for marijuana, a component of marijuana, or marijuana metabolites and is a registered qualifying patient shall be exempted from the disciplinary actions contained in this section unless:

6.1.5.1 The employee was impaired by marijuana at the jobsite.

6.1.5.2 Employment of the registered qualifying patient would cause the owner to lose monetary or licensing-related benefits under Federal law.

6.2 A contractor or subcontractor shall report the positive test result to the employee's professional licensing board, if applicable.

21 DE Reg. 503 (12/01/17)

7.0 Contractor and Subcontractor Certification of Compliance with Regulations

7.1 During the term of the contract:

7.1.1 During the term of the contract, contractors and subcontractors on the jobsite for more than 30 days shall maintain testing data that includes but is not limited to the data elements contained in subsection 7.1.2:

7.1.1.1 A contractor or subcontractor that is employed on the jobsite for less than 30 days shall not be subject to the reporting requirements contained in subsection 7.1.2 of this regulation, unless the owner specifies that such reporting is required in the invitation to bid or specifications relating to the work to be performed.

7.1.2 The data shall at a minimum contain the following elements:

7.1.2.1 The number of employees who worked on the jobsite during the previous month or quarter.

7.1.2.2 The number of employees subjected to random testing during the previous month or quarter.

7.1.2.3 The number of negative results and the number of positive results.

7.1.2.4 Action taken by the contractor or subcontractor on an employee who failed or tested positive to a random test.

7.1.3 Test results must be kept by a contractor or subcontractor for a minimum of 1 year subsequent to the date of close out of the public works project.

7.1.4 Any positive test result of an employee working on a public works jobsite including the employee name and action taken in response by a contractor or subcontractor must be reported by the contractor or subcontractor to the owner in writing within 24 hours of the contractor or subcontractor receiving the test results.

7.1.5 The owner shall have the right to periodically audit all contractor and subcontractor test results at the contractor or subcontractor's offices or by other means to make the data available for inspection by the owner.

7.1.6 The failure to comply with these reporting requirements may be considered a material breach of any agreement relating to the performance of work by the contractor or subcontractor.

21 DE Reg. 503 (12/01/17)

8.0 Penalties

8.1 A contractor or subcontractor on a large public works contract that fails to implement a mandatory drug testing program in accordance with this regulation or falsifies testing results shall be subject to the following sanctions:

8.1.1 Written warning (1st offense).

8.1.2 Prohibition from bidding on new public works jobs for a period not to exceed 3 months (2nd offense) and 1 year (3rd offense).

8.1.3 For subsequent offenses, debarment or bond revocation.

8.2 Notwithstanding any other provision of this regulation, if any failure to comply with the requirements of this regulation are particularly flagrant or egregious, the owner may seek a termination for cause, a temporary suspension, a determination that the contractor or subcontractor is not responsible, debarment or bond revocation, and any other statutory, common law, or equitable remedy.

19 DE Reg. 207 (09/01/15)

21 DE Reg. 503 (12/01/17)

21 DE Reg. 645 (02/01/18)

28 DE Reg. 228 (09/01/24)
28 DE Reg. 326 (10/01/24)

SECTION 011100 - SUMMARY OF WORK

1. RELATED DOCUMENTS

   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Sections, apply to work of this Section.

2. CONTRACTS

   A. The work will be performed under separate prime contracts managed by the Construction Manager.

3. ALTERATIONS & COORDINATION

   A. Contractor shall be responsible to coordinate their work with the work of others, including, but not limited to, the preparation of general coordination drawings, diagrams and schedules, and control of site utilization, from the beginning of activity, through project close-out and warranty periods.

4. KNOWLEDGE OF CONTRACT REQUIREMENTS

   A. The Contractor and his Subcontractors, Sub-subcontractors and material men shall consult in detail the Contract Documents for instructions and requirements pertaining to the Work, and at his and their cost, shall provide all labor, materials, equipment and services necessary to furnish, install and complete the work in strict conformance with all provisions thereof.

   B. The Contractor will be held to have examined the site of the Work prior to submitting his proposal and informed himself, his Subcontractors, Sub-subcontractors and material men of all existing conditions affecting the execution of the Work.

   C. The Contractor will be held to have examined the Contract Documents and modifications thereto, as they may affect subdivisions of the Work and informed himself, his Subcontractors, Sub-subcontractors and material men of all conditions thereof affecting the execution of the Work.

   D. The Scope of Work for the Contract is not necessarily limited to the description of each section of the Specifications and the illustrations shown on the Drawings. Include all minor items not expressly indicated in the Contract Documents, or as might be found necessary as a result of field conditions, in order to complete the Work as it is intended, without any gaps between the various subdivisions of work.

   E. The Contractor will be held to be thoroughly familiar with all conditions affecting labor in the area of the Project including, but not limited to, Unions, incentive pay, procurements, living, parking and commuting conditions and to have informed his Subcontractors and Sub-subcontractors thereof.

5. CONTRACT DOCUMENTS INFORMATION

A. The Contract Documents are prepared in accordance with available information as to existing conditions and locations. If, during construction, conditions are revealed at variance with the Contract Documents, notify the Construction Manager immediately, but no more than three (3) days from the day the variance is first known. Failure to give timely notice shall operate to waive any claim Contractor might otherwise have for an adjustment to Contract Time or Sum as a consequence of such variance.

B. The Specifications determine the kinds and methods of installation of the various materials, the Drawings establish the quantities, dimensions and details of materials, the schedules on the Drawings give the location, type and extent of the materials.

C. Dimensions given on the Drawings govern scale measurements and large scale drawings govern small scale drawings, except as to anything omitted unless such omission is expressly noted on the large scale drawings.

D. The techniques or methods of specifying to record requirements varies throughout text, and may include “prescriptive”, “open generic/descriptive”, “compliance with standards”, “performance”, “proprietary”, or a combination of these. The methods used for specifying one unit of work has no bearing on requirements for another unit of work.

E. Whenever a material, article or piece of equipment is referred to in the singular number in the Contract Documents, it shall be the same as referring to it in the plural. As many such materials, articles or pieces of equipment shall be provided as are required to complete the Work.

F. Whenever a material, article or piece of equipment is specified by reference to a governmental, trade association of similar standard, it shall comply with the requirements of the latest publication thereof and amendments thereto in effect on the bid date.

G. In addition to the requirements of the Contract Documents, Contractor’s work shall also comply with applicable standards of the construction industry and those industry standards are made a part of Contract Documents by reference, as if copied directly into Contract Documents, or as if published copies were bound herein.

H. Where compliance with two (2) or more industry standards, contract requirements, or sets of requirements is specified, and overlapping of those different standards or requirements establishes different or conflicting minimums or levels of quality, then the most stringent requirements, which are generally recognized to be also the most costly, is intended and will be enforced, unless specifically detailed language written into the Contract Documents clearly indicates that a less stringent requirement is to be fulfilled. Refer apparently equal but different requirements, and uncertainties as to which level of quality is more stringent, to Architect for decision before proceeding.

I. Reference standards referenced directly in Contract Documents or by governing regulations have precedence over non-reference standards which are recognized in industry for applicability of

work.

J. Contractor's bid is based on the complete set of Contract Documents including documents not specifically issued as part of the bid pack but referenced in same.

6. SCOPE OF WORK/GENERAL INFORMATION

A. A Scope of Work for each contract to be awarded on the project follows in this section. When a Contract has been awarded to a Contractor, the successful Contractor will be listed after the title of the Contract. When no Contract has yet been awarded, no Contractor's name will be listed. Previous Scopes of Work include addendum changes.

B. Contractor is responsible for performing the work listed in the Summary of Work for his contract. Contractor is also responsible for knowing the work that has been assigned to preceding contracts. No additional compensation or extension of time will be allowed a Contractor due to his ignorance of the work assigned to his Contract or to other contracts which may affect his work. The Contractor is responsible, however, for all items which are covered in the Specifications and Drawings relating to their Contract if not specifically mentioned in the Summary of Work.

C. The Construction Manager will provide on-site a source for temporary electric, temporary water and portable sanitation facilities only. It is each Contractor's responsibility to make the necessary connections, including all material for temporary electric and water. Please note that utility charges for office trailers will be the responsibility of the individual Contractors.

D. A dumpster will be provided on site for free use by Contractors to dispose of non-hazardous, common, work-related refuse. Clean-up is the responsibility of each Contractor. Clean up shall be performed on a daily basis. Contractors not complying will be advised in writing and back charged for all costs associated with the cleanup of their work.

E. Contractors are reminded that there are limited storage areas available on site. Off-site storage will be the responsibility of each individual Contractor.

F. Office trailer permits off site will be the responsibility of each individual Contractor. On site Contractor's field offices, one (1) per Contractor, if required, will be located as directed by the Construction Manager.

G. Contractor will be prepared to discuss and submit a detailed project schedule seven (7) days after receipt of Notice to Proceed and to begin its submittal process. The Project Schedule is an integral part of this contract. Certain construction sequences and priorities must take place in order to meet the target dates. Concentrated work periods will occur and each Contractor is responsible to staff the project as required by the current Construction Schedule or as directed by the Construction Manager. Contractor will cooperate with the Construction Manager in planning and meeting the required sequences of work and Project Schedule as periodically updated by the Construction Manager.

H. All bids must include insurance limits in accordance with Article 11 of the Section 007300 SUPPLEMENTARY CONDITIONS.

I. Hoisting, scaffolding and material handling is the responsibility of each Contractor, unless otherwise noted.

J. Contractor will be responsible for layout of its own work. The Construction Manager will provide benchmark and layout of the building line.

K. Contractor will be responsible to keep clean public roadways soiled by construction traffic on a daily basis. If cleaning is not done, the Construction Manager may perform the cleaning on an overtime basis and backcharge the Contractor responsible.

L. Contractor Scopes of Work and Schedule are interrelated. Familiarity with each is required.

M. The Construction Manager will provide testing services for soil, concrete and steel. Other testing as required by the Contract Documents will be in accordance with the technical specifications and/or the individual scope of work. Refer to Specification Section 004500 - QUALITY CONTROL.

N. Safety is the responsibility of each individual Contractor. The project will be governed under the guidelines of OSHA.

O. Inter-Contractor shop drawing distribution will be performed by the Construction Manager. Contractor is individually responsible for either coordinating his work with these distributed drawings or notifying the Construction Manager, in writing, of any discrepancies.

P. Coordination with other trades will be required. The Contractor will be required to attend periodic coordination meetings with other trades where requirements, conflicts and coordination issues will be discussed and resolved. Attendance when requested will be mandatory. If inter-Contractor coordination is not satisfactorily performed, the conflicting Contractors shall mutually share the cost to relocate and/or reinstall their work.

Q. Contractor shall submit a schedule of values to the Construction Manager prior to the submission of their first invoice for approval

R. Contractor is expected to review and coordinate its Work with the complete set of Contract Documents, including all items noted as by his trade whether or not shown on that particular set of drawings. Documents are available at the site for review.

S. Contractor is responsible for obtaining all necessary permits required for his work, including street permits. Unless otherwise noted, building permit shall be secured by the Construction Manager. Any subcontractor who will be restricting access to street, right of way or adjacent property must notify the Construction Manager 48 hours in advance.

T. Contractor's License: Submit a copy of all business licenses required by local and state agencies.

U. Contractor shall absorb, without additional compensation, any and all costs of working beyond normal hours to maintain job progress in accordance with the current construction schedule.

V. No asbestos or PCB's in or on any material or equipment will be accepted or allowed on this project. All hazardous materials will be treated in accordance with all State and Federal regulations.

W. Daily cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Contractor will be individually back charged by the Construction Manager for clean up not satisfactorily performed by the Contractor.

X. In the event asbestos is uncovered, the Contractor shall notify the Construction Manager of the areas requiring removal of asbestos. The Construction Manager shall then coordinate the removal with the Owner.

Y. The Safety Cable System shall not be altered or removed without a written request submitted to the Project Manager with a copy to the Field Manager. It shall be the responsibility of each and every Contractor that is removing or altering the Safety Cable System to maintain the fall protection safety provided by the safety cable and not leave the area unprotected. Each and every Contractor shall be responsible to re-install the Safety Cable System immediately after work is completed. Each and every Contractor shall be responsible to re-install the Safety Cable System in accordance to OSHA standards.

Z. Normal work hours for this project are from 7:00 a.m. to 3:30 p.m. Any work to be performed outside of these hours must receive prior approval from the Construction Manager. Requests to work beyond normal work hours shall be submitted at least 48 hours prior.

AA. Contractor is responsible for having a competent project superintendent/foreman on-site during all work performed under its contract.

AB. In the event the Contractor has non-English speaking employees or subcontractors on the project, they shall have a superintendent or foreman on site, at all times, who speaks English and can communicate with Contractor's employees. Should the Contractor fail to meet this requirement, at any time, Construction Manager may direct all Work to stop until the proper supervision is on site. The Contractor will be responsible for maintaining the project work schedule and make up at its own expense, any delay to the Schedule resulting from the work stoppage.

AC. Punch List Procedures: Contractor shall be given a copy of the punch list with his appropriate work identified. Contractor shall have nine (9) calendar work days to complete its punch list work. On the 10th day or as determined by the Construction Manager, the Construction Manager shall employ other contractors, as required, to complete any incomplete punch list work and retain from the appropriate Contractors retainage all costs incurred.

AD. Contractor shall provide the necessary safety barricades and railings required to complete their work and comply with all OSHA, local code and contract specifications.

AE. **Prohibition of Using Photographs on EDiS Projects**: The Contractor and all associated subcontractors agrees to not issue any news release or advertising pertaining to the Work or the Project, including references to the Project on the Contractor's/subcontractor website or other social media outlets, without obtaining EDiS' prior written approval, in each instance. The Contractor, for itself, its employees, vendors and subcontractors, agrees to not use the name of the Owner, the Project, EDiS or any photographs, videos, or other images of the Project in connection with any of Contractor's business promotion activities, advertising, website, social media outlets, or operations, without EDiS' prior written approval in each instance.

CONTRACT NO. A-01 - SITEWORK

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification Sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Division 3	Concrete
Section 107500	Flagpoles
Division 22	Plumbing
Division 26	Electrical
Division 31	Earthwork
Division 32	Bases, Ballasts, and Paving
Division 33	Utilities

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide sitework, storm, sanitary and water utilities, concrete and asphalt paving, striping, curbs, walks, signage, exterior concrete steps and ramps, and topsoil/seeding. Exterior slabs and pads shown on the structural plans will be provided by Contract A-03 : Concrete.
    a. This Contractor shall include in the Base Bid the cost of remobilization, cleaning and tack coating the asphalt base course in order to install the asphalt top coat.

2. Furnish and install all site signage. This includes all traffic, pedestrian and building related signage not mounted on buildings, including fire lane curbing and signage.

3. Provide fire supply piping including fire hydrants and loop. Color code fire hydrants as required by the local jurisdiction based upon water pressure. Provide fire lane striping including painting of adjacent curbs as required by local jurisdiction having authority.

4. Provide site amenities (decorative and steel pipe bollards, bike racks, flagpoles (including bases), manual and automatic gates (including associated gate hardware), benches, etc.). Include excavation and concrete to support these amenities as shown in the project documents and required by manufacturer's instructions.

5. Provide fencing (chain link and ornamental) including gate hardware, and post and cable fencing. Provide louvered gates at the mechanical yard.

6. Provide removal of mock-up wall at Construction Manager's request. Mock-up wall to be disposed of to dumpster supplied by CM.

7. Provide perimeter stormwater drains at all buildings (including within 5′ of the building perimeter). Provide downspout adaptors and coordinate with roofer for the correct downspout size.

8. Provide underground infiltration areas (stormtech system) including flexstorm inserts in all upstream structures with open grates.

9. Furnish and install and maintain concrete wash out areas for other subcontractors and their suppliers for project duration. Concrete wash out station to be dumpster type, include liner. Relocate as required by EDiS. Remove this item at conclusion of project and complete as indicated on finished drawings.

10. Furnish and install wash station, labor to wash tires, clean and drain the area as required before vehicles leave the site daily. Clean tires and tracks of all vehicles before leaving the construction site. Wash station will be utilized by other contractors and will be removed by this contractor only when directed by EDiS. Furnish and install Non-freeze Hose Bib, water line, valve box & drainpipe to daylight or plug for the contractor tire wash areas, and for building construction.

11. Provide a temporary water means for other trades to utilize. Include all costs associated with metering from local utilities as well as valves and hoses for contractors to utilize. The Construction Manager will not provide this service. Location is TBD by EDiS.

12. Provide an allocation, included in base bid, to provide, maintain and remove upon construction manager direction, 2,000′ of stoned roadway, 10′-0″ wide. Road shall consist of fabric, 10″ of #3 stone for the length of the road and the means to compact it. Allocation to include removal of temporary stone road from site upon request from construction manager.

13. Provide an allocation, included in base bid, to provide, maintain and remove upon construction manager direction, a total of 5 temporary crane pads; each a 40′x 40′ stoned area. Pads shall consist of fabric, 10″ of #3 stone for the area of the pad, and the means to compact it. Allocation to include removal of temporary stone pads from site upon request from construction manager.

14. This Contractor shall provide and maintain all temporary access roads as detailed in Contract Documents, until completion of project. Include snow removal.

15. Furnish, install and remove temporary orange construction fencing as required by Construction Manager (including 1,000 linear feet in base bid).

16. Furnish, install, maintain and remove temporary chain link site fencing (include 1,000′ in base bid), temporary walks as shown on the site plan. Include driven posts in lawn areas and weighted supports in paved areas. Maintain this work until Substantial Completion.

17. Furnish, install, maintain and remove sediment control system including sediment control plan. Maintain sediment control until substantial completion established by DNREC or another authority having jurisdiction.

18. Provide, maintain, and remove stabilized site entrances.

19. This Contractor shall visit the site of the proposed work, fully acquaint and familiarize themselves with the conditions as they exist and the character of the operations to be carried out under the proposed Contract, and make such investigation as they may see fit so that they shall fully understand the facilities, physical conditions and restrictions affecting the work under the Contract. Claims for additional compensation and/or extensions of time because of Contractor's failure to familiarize themselves with all conditions which might affect the work shall not be allowed.

20. Street openings made for the shutting off or tapping of utility lines or for any other purpose shall be backfilled, tamped and the surfaces restored in accordance with the requirement of applicable local codes or to match existing; whichever is greater.

21. Provide removal of asphalt paving and excavation of a test pit in outside lane of Delaware Route 7 to locate and determine depth of existing water line. This contractor is to provide access to water company contractors for possible relocation of water line if required. Include all traffic control and safety devices required.

22. Clearing, grubbing and removal of trees, roots and stumps.

23. Topsoil stripping and stockpiling on site. Respread topsoil from the established topsoil stockpiles. Provide temporary stabilization grass seeding at all areas following the completion of construction activities and as required by sequence of construction.

24. Rock excavation work is defined as work consisting of "bedrock and ledgerock removal for structures and trenches that cannot be accomplished without either blasting or using rippers. This work also consists of the use or disposal of such excavated material and backfilling the excavation with suitable material" per DelDOT Standard Specifications dated August 2001.

25. Rock excavation and backfilling for structures and trenches is defined as work consisting of "bedrock and ledgerock removal for structures and trenches that cannot be accomplished without either blasting or using rippers. This work also consists of the use or disposal of such excavated material and backfilling the excavation with suitable material" per DelDOT Standard Specifications dated August 2001.

26. Contractors should carefully review the soil borings as they relate to the extent of rubble to be removed and other man made obstructions. Saw cutting and removal of sidewalks, curbs, etc. in the performance of work is this Contractor's responsibility. Rock excavation (if applicable) will be paid for on a unit price basis.

27. Rough grading for area defined on site drawings for building, lawn areas, bituminous roads, parking and walkways. Preparation of subgrade for building slabs, walks and pavements.

28. Sitework contractor is to provide rough grading for area defined on site drawings for building, lawn areas, bituminous roads, parking and walkways. Preparation of subgrade for slabs, walks,

and pavements. The Sitework Contractor to extend the bulk excavation outside building plan in order to facilitate foundation construction and maintain safety requirements. Written acceptance of the building pad condition will be provided by the concrete contractor before foundation work proceeds. The Concrete Contractor will be responsible for laying out all concrete work as shown on the structural and architectural drawings. Once the Concrete Contractor has accepted this work it will be the responsibility of the Concrete Contractor to maintain and dewater the building pad and all excavations until the concrete work is complete and backfilled. The Concrete Contractor and Sitework Contractor are to coordinate this procedure so that there are no additional costs to the Owner for additional excavation or concrete. Spoils left after backfilling of foundations is complete are to be left outside the building perimeter by the concrete contractor and gathered by the sitework contractor and spread on site.

29. Proof rolling of limit of excavation.

30. Furnish, install and maintain select fill under slab.

31. Provide a certified construction reviewer (CCR) to perform inspections and provide written reports; signed and sealed by a professional engineer.

32. All utilities shall be brought to within +/- 5 feet of the building line by this Contractor. Sitework contractor will bring domestic and fire mains to within 5′ of building prior to foundation installation. Sitework contractor will return to extend domestic and fire lines into building to 1′ above slab following foundation installation. Sitework contractor will flush water lines following completion of pipe into building.

33. Provide all DelDOT permits related to work for this project. Include all required traffic control plans and drawings.

34. Backfilling as detailed below is the responsibility of this Contractor. Soil types shall be in accordance with Del Dot standard specifications.

35. It is the intent to use on site material and not imported fill. The use of this on site material shall conform with the compaction requirements as specified on Civil drawings and in specification Division 31. If on site material does not meet these requirements, a unit price for imported fill will be used.

36. This is not a balanced site. 20,000 cy of the excess soils will be provided to the upcoming William Penn High School project. This Contract A-01 is to include loading trucks supplied by site contractor at the high school project only (no transport required by this Contract A-01). Contract A-01 is to provide removal of all remaining excess soils from site.

37. Provide all dewatering of excavations until final acceptance. Provide dewatering for perimeter waterproofer.

38. Provide perimeter protection of all excavated areas until suitably backfilled.

39. Utilize directional drilling methods where indicated on project documents.

40. Provide all traffic control measures, including flagger, signage, barricades, etc. Secure all permits for work completed within public right-of-way(s).Include demo and removal of all existing structures as noted on project documents.

41. Include demo and removal of all existing structures as noted on project documents.

42. Provide street cleaning of mud etc. on a daily basis throughout the entirety of the project including when this sitework contractor is not working on site.

43. Include all costs for temporary barricades, arrows, pedestrian protection, flagmen, etc. required to complete the work.

44. Site utilities to courtyards, including irrigation lines as part of this contract.

45. Base bid shall include all standard dewatering measures; utilizing trenches, crocks, stone and portable pumping measures. This contractor to provide these measures as required to perform their work. Well pointing if necessary will be handled as a negotiated cost by the Owner.

46. ASPHALT CEMENT COST ADJUSTMENT
    a. Payments to the Contractor shall be adjusted to reflect increase or decreases in the Delaware Posted Asphalt Cement Price when compared to the Project Asphalt Cement Base Price, as defined in these Special Provisions.
    b. The Delaware Posted Asphalt Cement Price will be issued monthly by the Department and will be the industry price for Asphalt Cement, F.O.B. Philadelphia, Pennsylvania.
    c. All deviations of the Delaware Posted Asphalt Cement Price from the Project Asphalt Cement Base Price are eligible for cost adjustment. No minimum increases or decreases or corresponding percentages are required to qualify for cost adjustment.
    d. Actual quantity of asphalt cement qualifying for any Asphalt Cement Cost Adjustment will be computed on the basis of weight tickets and asphalt percentage from the approved job mix formula.
    e. For Recycled Hot-Mix the asphalt percentage eligible for cost adjustment shall be only the new asphalt cement added to the mix.
    f. The Asphalt cement cost adjustment will be calculated on grade PG 64-22 asphalt regardless of the actual grade of asphalt used. The Project Asphalt Cement Base Price for the project will be based on the August 1st price posted on DelDOT's website.
    g. If the Contractor exceeds the authorized allotted completion time, the price of asphalt cement on the last authorized allotted work day, shall be the prices used for cost adjustment. However, if the industry posted price for asphalt cement goes down, the asphalt cement cost shall be adjusted downward accordingly.

47. Provide all site survey and layout of this contract work from a licensed surveyor. This work includes, but not limited to, accomplishing cuts and fills, locating utilities, layout of roads and walkways, and establishing site boundaries. Benchmarks and control points will be established

by the CM.

48. Before ANY excavation work is to commence, the Contractor/Excavator shall contact the utility companies or utility owners and advise them of the proposed work and ask them to mark the location of the underground utility installations. This notification shall be done within established or customary local response times. If the work is on private property and the utility company will not mark out the utilities, the Contractor/Excavator will hire a private locating service to mark the utilities. Once the utilities are located and marked, the Contractor/Excavator will excavate by hand or use a vacuum truck to expose the utilities and record the exact location and elevation of the utilities. The Contractor/Excavator must submit the Excavation Permit to EDiS Company verifying their assurance of communication with the utility companies or utility owners. The Contractor/Excavator must follow State, Local, and Federal Guidelines prior to proceeding with excavations. The Contractor/Excavator will have these marks restored as long as there is work to perform. Once the Contractor has installed new utilities, they will provide to EDiS Company an as-built drawing, within 7 days, showing the exact location and elevation of the utilities. The installing Contractor will be responsible for locating and marking these utilities for other contractors that may have work in the same area.Provide As-built drawings. Maintain an updated red-lined set on-site, available to EDiS upon request.

49. In addition to the insurance specified in Section 006216, this contractor will provide Pollution Insurance, with limits of $2,000,000 per occurrence and $2,000,000 aggregate.

50. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

51. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. CSD and EDiS will not be responsible for any lost tools, materials or equipment.

52. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

53. Contractor must provide additional crews as needed to maintain the project schedule.

54. Provide BIM services as detailed in spec section 013700 BIM Execution Plan.
    a. Even if this contract is not shown to have responsibilities in the BIM execution and coordination, this contract is to include providing a representative at a minimum of six (6) BIM Coordination meetings.
    b. The sitework contractor is to provide BIM coordination drawings from the invert of pipes leaving the building (coordinated with the MEP BIM Design) to the first precast enclosure (manhole, catch basin, etc.)

55. BIM Coordination : This contractor will include $700 in their bid proposal to pay for the licensing

agreement with Revizto for BIM Coordination of all trades.

56. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 60 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

57. Provide a $50,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-02 - LANDSCAPING

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Division 3	Concrete
Division 22	Plumbing
Division 26	Electrical
Division 31	Earthwork
Division 32	Bases, Ballasts, and Paving
Division 33	Utilities

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Fertilize topsoil prior to permanent seeding as specified in the geotechnical reports and civil drawings. Topsoil to be spread by Contract A-01 : Sitework. Prior to seeding, this contractor is responsible to have the topsoil tested and to supply and install amenities (fertilizer, lime, etc) as required by the test report. Provide permanent stabilization grass seeding at all areas following the completion of construction activities. This contractor is responsible for all weeding, watering, fertilization, and grass cutting to ensure 100% grass growth in the entirety of these areas until permanent certificate of occupancy is approved.

2. Provide all plant material and all associated work including, but not limited to, staking, watering, weeding, etc.

3. Planting soil mix in beds and topsoil to be provided by the Sitework Subcontractor. Provide all additional soil mix required to set plant materials and final grading.

4. Provide filter fabric, weed, check and mulch.

5. Provide all sod.

6. Provide specified warranties.

7. Provide As-built drawings. Maintain an updated red-lined set on-site, available to EDiS upon request.

8. In addition to the insurance specified in Section 006216, this contractor will provide Pollution Insurance, with limits of $2,000,000 per occurrence and $2,000,000 aggregate.

9. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

10. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. CSD and EDiS will not be responsible for any lost tools, materials or equipment.

11. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

12. Contractor must provide additional crews as needed to maintain the project schedule.

13. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 90 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

14. Provide a $5,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-03 - CONCRETE

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification Sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Division 3	Concrete

Section 055000	Metal Fabrications
Section 072100	Thermal Insulation
Division 31	Earthwork

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide concrete footings, foundation walls, piers, wall footings, grade beams, slabs on grade, slabs on deck, and all reinforcing steel and welded wire reinforcement.
   a. Include excavation and backfill.
   b. Provide concrete infill slab inside the walk-in freezers and refrigerators after freezers and refrigerators have been set in place. Also grout the space between the freezers and refrigerator and the surrounding concrete. Coordinate requirements with the Food Service contractor.
   c. Provide concrete footers and piers at exterior brick columns and monumental signage including excavation and backfill after masonry foundation walls are complete.

2. Provide exterior concrete slabs and turndown slabs shown on the structural plans.

3. Provide pipe and backfill for perimeter foundation drains.

4. Provide concrete foundation for Mock up wall as required. Include excavation if required.

5. Set pour stop 2' outside the perimeter of pool, including all pool plumbing and drainage systems. Include separate mobilization to complete the SOG to finish to the pool assembly.

6. Provide concrete slab-on-grade in Pool 155 to outside perimeter of pool drain as shown/dimensioned on Sheet AP101.

7. Provide concrete work at monumental sign. Include excavation, concrete footers and piers, and backfill after mason completes below grade masonry installation.

8. Provide concrete stairs on grade and thickened slabs within the building perimeter. Include all excavation and grading necessary to complete this work.

9. Provide thickened slab footings at all interior CMU walls as required in the Structural Drawings sheet notes.

10. Provide excavation, installation, and backfill for the concrete foundations and reinforcing steel associated with the exterior masonry walls at the building entrances.

11. Provide all precast concrete elements within the building.

12. Provide all form work, concrete, reinforcement, excavation, etc. required to complete this work.

13. This Subcontractor will be responsible for laying out all concrete work as shown on the structural and architectural drawings. Coordination of drawings may be required.

14. This Contractor to furnish and install reinforcing steel, admixtures, curing compound, sealers as required in the Contract Documents.

15. Provide Perimeter insulation at foundation walls.

16. Provide dewatering for ~~perimeter~~ foundation waterproofer.

17. Underslab vapor barrier, insulation, reglets, waterstops, control and construction joints (including required caulking at control and construction joints).

18. Placement of related items furnished under other Specification Sections.

19. Anchor bolts and leveling plates to be installed by this Contractor and furnished by the Structural Steel contractor. Installation within required tolerances. Anchor bolt assemblies to be placed with templates only. Contractor shall supply certified anchor bolt as-built drawings to steel erector for coordination prior to steel placement. Concrete Contractor is responsible to adjust or replace any anchor bolts found to be outside of specified tolerances.

20. All blockouts and embedments required by plans and specifications.

21. This Subcontractor to install sleeves in concrete walls furnished by the contractor providing the utility.

22. This Contractor is responsible for grouting all structural steel base or leveling plates.

23. This contractor shall include all hot and cold concrete weather materials and practices. This includes, but is not limited to frost protection, hot/cold water additives and admixtures and pumping as required. This Contractor is also responsible for the premiums associated with any added costs for hot water, heated aggregate and all admixtures for cold or hot weather concrete practices.

24. Coordinate the "Notch" in the concrete slabs to allow for a future Contractor to easily install expansion joint details. Provide depressed slabs where shown for future floor finishes.

25. Provide concrete fill at steel pan stair treads, landings and associated items.

26. Provide dewatering after acceptance from Sitework Contractor until re-acceptance by the Sitework Contractor.

27. Provide caulking at Concrete slab control joints, expansion joints, isolation joints, and perimeter slab joints. Provide primers, bond breakers, and joint backers. Clean, prime, and prepare surfaces before application of caulks and sealants in accordance with specifications and manufacturer's recommendations.

28. Concrete Contractor will be responsible for laying out all concrete work as shown on the structural and architectural drawings. The sitework contractor is to provide a flat, compacted surface at subgrade prior to the start of foundation layout and installation. Written acceptance of the building pad condition will be provided by the concrete contractor before foundation work proceeds. Once the Concrete Contractor has accepted this work it will be the responsibility of the Concrete Contractor to maintain and dewater the building pad and all excavations until the concrete work is complete and backfilled. The Concrete contractor is to provide access to foundation excavations to the Masonry and waterproofing Contractors for foundation work. Concrete contractor owns dewatering during masonry and waterproofing work and backfill after foundation masonry work is complete. The Concrete Contractor, Masonry Contractor, Roofer, and sitework Contractor are to coordinate this procedure so that there are no additional costs to the Owner for additional excavation or concrete. Spoils left after backfilling of foundations is complete are to be left outside the building perimeter by the concrete contractor and gathered by the sitework contractor and spread on site.

29. Before ANY excavation work is to commence, the Contractor/Excavator shall contact the utility companies or utility owners and advise them of the proposed work and ask them to mark the location of the underground utility installations. This notification shall be done within established or customary local response times. If the work is on private property and the utility company will not mark out the utilities, the Contractor/Excavator will hire a private locating service to mark the utilities. Once the utilities are located and marked, the Contractor/Excavator will excavate by hand or use a vacuum truck to expose the utilities and record the exact location and elevation of the utilities. The Contractor/Excavator must submit the Excavation Permit to EDiS Company verifying their assurance of communication with the utility companies or utility owners. The Contractor/Excavator must follow State, Local, and Federal Guidelines prior to proceeding with excavations. The Contractor/Excavator will have these marks restored as long as there is work to perform. Once the Contractor has installed new utilities, they will provide to EDiS Company an as-built drawing, within 7 days, showing the exact location and elevation of the utilities. The installing Contractor will be responsible for locating and marking these utilities for other contractors that may have work in the same area.

30. This contractor is to regrade building subgrade following backfilling of foundation excavation. Building Pad subgrade is to be brought to compaction requirements specified in the project documents. All spoils are to be pushed outside of the building perimeter and will be collected and spread on site by the sitework contractor.

31. This Contractor is responsible for excavating all stairs and ramps as shown on drawings. This Contractor is also responsible for the backfill of these areas.

32. Provide and maintain perimeter fall protection at excavated area per OSHA standards.

33. Equipment bases and foundations shall be the responsibility of the Contractor providing the equipment. This contractor to provide an exterior turn-down slab (5′ x 6′ x 6″) for the new incoming gas service. Final location to be directed by the construction manager.

34. Asphalt concrete paving and portland cement concrete paving, sidewalks and curbs shall be provided by others.

35. Prepare concrete SOG at vestibules to proper elevations for walk off mat.

36. This Contractor shall include the finishing of concrete slabs around floor penetrations throughout all slab areas. These penetrations will consist of electrical boxes, stubbed conduits, mechanical piping and electrical and technology conduit stubs, etc

37. This Contractor shall also include all work included in finishing the concrete floors to all floor drains and or trench drains. Include all sloping and beveling to create a positive flow to the drains.

38. Provide all means of transporting concrete including, but not limited to: pump trucks, cranes, ramps, chutes, buggies.

39. All concrete testing will be completed by the Construction Manager, however, it will be the responsibility of this Contractor to furnish all samples.

40. Provide off site disposal of all unsuitable excavated materials.

41. This Contractor shall provide written documentation by a third party testing agency that all concrete slabs are within the tolerance required by the contract documents. Testing and analysis to be paid for by this Contractor.

42. Provide specified sloping for floor drains/trenches in kitchen, showers, as detailed (Drains to be furnished by Mechanical Contractor.)

43. This Contractor shall include a minimum of ten additional out of sequence remobilizations for concrete slab installation.

44. Contractor must provide additional crews as needed to maintain the project schedule.

45. In addition to the insurance specified in Section 006216, this contractor will provide Pollution Insurance, with limits of $2,000,000 per occurrence and $2,000,000 aggregate.

46. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

47. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. CSD and EDiS will not be responsible for any lost tools, materials or equipment.

48. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

49. Provide BIM services as detailed in spec section 013700 BIM Execution Plan.
    a. Even if this contract is not shown to have responsibilities in the BIM execution and coordination, this contract is to include providing a representative at a minimum of six (6) BIM Coordination meetings.

50. BIM Coordination : This contractor will include $700 in their bid proposal to pay for the licensing agreement with Revizto for BIM Coordination of all trades.

51. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 60 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

52. Provide a $30,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-04- MASONRY

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Division 4	Masonry
Section 055000	Metal Fabrications
Section 071113	Bituminous Dampproofing
Section 072100	Thermal Insulation
Section 072119	Foamed-In-Place Insulation
Section 072500	Weather Barriers
Section 076200	Sheet Metal Flashing & Trim
Section 078400	Firestopping
Section 079200	Joint Sealants

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide CMU, Brick veneer, ground and split face masonry units, glazed block, Calcium Silicate Manufactured Stone masonry, cast stone masonry, stone masonry veneer, reinforcing, accessories and related work

2. Provide foundation masonry (waterproofing by Contract A-08). Include dewatering for waterproofer.

3. Install sleeves in masonry walls (foundation and above ground) furnished by the contractor providing the utility.

4. Provide CMU, brick, decorative block, and capstone for new exterior walls at the building entrances, courtyard terrace walls and piers, loading dock, etc.

5. Provide masonry work at monumental sign. Excavation, concrete footers and piers, and backfill by Concrete Contractor.

6. Caulking of masonry to masonry and to dissimilar materials is to be by Contract A-10 : Joint Sealants. Clean, prime, and prepare surfaces before application of caulks and sealants in accordance with specifications and manufacturer's recommendations. Fire and Acoustical Sealants for masonry walls is to be by this Contract: A-04.

7. Provide spray polyurethane foam insulating air barrier applied at all locations (vertical and horizontal) behind vertical brick and stone surfaces and over CMU back-up and exterior sheathing board. This includes all exterior sheathing, whether behind masonry or not,

include spray insulation termination angles as needed for the spray foam insulation installation. Include DC-315 thermal barrier product where required. Provide intumescent coating on top of the spray insulation as detailed on various wall types.

8. Provide steel angle support at top of masonry walls per details as shown in the architectural or structural plans whichever is more stringent.

9. Integral masonry flashings, expansion joints, insulation and other related items as required.

10. Provide 2-hour fire rated expansion joints for masonry-to-masonry .

11. Provide Mock up as required. Concrete foundation to be provided by Contract A-03: Concrete

12. Grouting of door frames at masonry openings. 2nd Floor and above stair tower door frames will be installed after CMU stair towers are erected and 2nd floor slabs are poured. Masonry contractor to include grouting of these frames after stair tower masonry walls are erected.

13. Provide weather protection and temporary material considerations for Hot/Cold weather installations as required to perform the work and maintain the project schedule. This contractor is responsible for temporary enclosures at mixing station and work areas to continue work through winter conditions. Any materials and or heating equipment for areas or materials will be provided by this contractor and billed against the allocation set below. All associated labor is to be provided by this contract under base bid.

14. Scaffolding as required to complete the work.

15. Dewatering of work areas.

16. Layout of the work including responsibility for all elevations and dimensions as they affect other Subcontractor's work.

17. Provide masonry or steel lintels either required by this Contract or install loose lintels furnished by others. This shall include attaching the loose lintels to the structure with bolts, fasteners, welding, etc. This Contractor will review the mechanical, plumbing and electrical drawings to determine the quantity and location of lintels that will be required where these utilities pass through masonry walls. This Contractor will coordinate with the Mechanical, Plumbing and Electrical Contractors to establish the layout and elevations before installing lintels.

18. Fill at hollow concrete masonry units. Grout all below grade masonry.

19. Setting of reinforcing steel in block walls.

20. Provide Cementitious parging.

21. Provide Bituminous Dampproofing

22. Provide Silicone waterproofing.

23. Provide Cast stone/limestone work.

24. Provide temporary protection for final wash down/cleaning of masonry. Provide final cleaning of masonry provided under this contract after completion of erection and after permission is given. Cleaning will be to the satisfaction of CSD/EDiS Company. Protect work of other Bid Categories from contact with cleaner.

25. Provide cleaning of masonry exterior back-up walls in advance of waterproofing installation by Contract A-10. Prepare masonry substrate for waterproofing installation including filling cracks, removing fins, and removing excess mortar.

26. Flashing Summary:
    a. Provide all thru-wall and cavity flashing within masonry walls no matter the substrate: by the Masonry Contractor.
    b. 2-piece receiver flashing to be installed in masonry walls shall be supplied by the Roofing Contractor to the mason for installation.
    c. Roofing contractor to provide flashing between termination of metal wall panels and EPDM roofing.

27. Cutting, fitting and building into masonry work, embedments provided by others.

28. Provide all acoustical sealants, fire safing fire stopping, and fire continuous sealant at top and bottom of masonry walls as shown on the Partition Types drawings. Also include steel penetrations through masonry walls.

29. Furnish and install all masonry veneer anchors where required.

30. Bond beams including reinforcing and fill.

31. This contractor will be responsible for providing their own dumpster and masonry debris disposal off site.

32. Provide potable water for masonry work from a mobile source.

33. Provide portable generators for temporary power needed for the performance of work.

34. Contractor must provide additional crews as needed to maintain the project schedule.

35. In addition to the insurance specified in Section 006216, this contractor will provide Pollution Insurance, with limits of $2,000,000 per occurrence and $2,000,000 aggregate.

36. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

37. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. CSD and EDiS will not be responsible for any lost tools, materials or equipment.

38. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

39. Provide BIM services as detailed in spec section 013700 BIM Execution Plan.
    a. Even if this contract is not shown to have responsibilities in the BIM execution and coordination, this contract is to include providing a representative at a minimum of six (6) BIM Coordination meetings.

40. BIM Coordination : This contractor will include $700 in their bid proposal to pay for the licensing agreement with Revizto for BIM Coordination of all trades.

41. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 60 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

42. Provide a $30,000 allocation to be used at the discretion of the Construction Manager.
43. Provide all mortar, grout, ladders, weeps, in-wall flashing, mortar nets, anchors, brick ties, lintels.

CONTRACT NO. A-05 - STRUCTURAL STEEL & MISCELLANEOUS METALS

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 051200	Structural Steel
Section 052100	Steel Joists
Section 053100	Steel Deck
Section 055000	Metal Fabrications
Section 055100	Metal Stairs
Section 055133	Metal Ladders
Section 055213	Pipe and Tube Railings

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide structural steel, trusses, joists and metal floor and roof decking. Provide acoustical decking and associated insulation.
   a. Coordinate pour stop locations with BIM Design. This contractor to receive as-builts of the installed foundations to coordinate final locations of the pour stop prior to shop installation.

2. Provide stairs, loose lintels, handrails, railings, steel ladders and accessories.

3. Furnish loose steel lintels, angles, plates, anchor bolts, leveling plates, and embedded items to the Concrete and Masonry contractors. Supply loose steel lintels to the mason for the mock-up wall if required.

4. Field check all anchor bolts prior to beginning erection.

5. Remove, modify, and replace the plywood covers installed by the Carpentry Contractor at all diamonds during the erection of steel as required to meet OSHA requirements.

6. Miscellaneous rough hardware, iron shapes, framing and support angles.

7. Provide masonry or precast anchors welded to steel columns and beams. This Contractor shall fabricate, weld and install all reinforcing anchors that connect the structural steel to the masonry systems whether they are field welds or shop welds. Provide all shop fabrication, field installation and field welding regardless of the weld symbols. Conditions that require in field welding and assembly are the responsibility of this Contractor. Field coordination with

the masonry installer will be this Contractor's responsibility.

8. Provide Pipe bollards.

9. Provide Stair nosings.

10. Provide Gratings.

11. Provide Roof screens, supports and grillage.

12. Provide Overhead door frames.

13. Provide Toilet partition supports. Provide restroom sink supports.

14. Provide Ships ladders.

15. Provide decorative metal railings. Include associated glass.

16. Galvanizing, as required.

17. Provide Anchoring devices, fasteners, inserts and other related items associated with the installation of the above items.

18. Provide all dunnage steel assemblies.

19. Provide all support steel framing for roof mounted equipment.

20. Provide steel framing at all openings in concrete slabs. Include framing at all MEP chase and duct penetrations, including where not indicated on structural drawings.

21. Provide all steel framing at the Aquarium feature within the Lobby. Reference sheet A-512.

22. Field touch-up paint.

23. No electrical power for welders will be provided.

24. Verify field dimensions.

25. Roof sump pans and related work.

26. Framing out for openings (roof drains, mechanical openings, access hatches, skylight, stairs, etc.). Assume opening frames will be field installed. All openings greater than 12 inches shall be reinforced with angle framing according to details on the structural drawings.

27. Prime paint systems, galvanizing, and related finishing of steel items, including touch up.

a. Coordinate steel priming with spray fireproofing requirements. Do not prime steel that is scheduled to receive spray fireproofing.

28. Masonry or precast anchors welded to steel columns and beams.

29. Supply and install shear studs.

30. Furnish, install, maintain and remove perimeter safety steel cables at all floor and roof levels to conform with all OHSA standards for all trades. Provide safety steel cables at mechanical and electrical chases, stair openings, atriums, etc. This Contractor shall include the maintenance portion of the perimeter cables. Costs to maintain the perimeter cables shall be taken from the allocation listed below and will be allocated by the Construction Manager on a time and material basis. All remaining allocation shall be returned to the Owner at completion.

31. The Steel Contractor will own all connections to masonry whether they are field welds or shop welds. Conditions that require in field welding and assembly are the responsibility of this Contractor. Field coordination with the masonry installer will be this Contractor's responsibility.

32. All steel testing will be the responsibility of the Construction Manager, however, this Subcontractor will cooperate with the testing agency in the inspection at the fabrication shop and in the field.

33. Layout, installation and alignment of attachments at the slab edge condition.

34. Provide data and submittal information related to the Scope of this Contract signed and sealed by a Professional Engineer as required by the Contract Documents.

35. This Contractor shall include all necessary staging, rigging, matting and remobilizations to accommodate this erection sequence.

36. In addition to the insurance specified in Section 006216, this contractor will provide Pollution Insurance, with limits of $2,000,000 per occurrence and $2,000,000 aggregate.

37. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

38. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. CSD and EDiS will not be responsible for any lost tools, materials or equipment.

39. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be incorporated into the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

40. Contractor must provide additional crews as needed to maintain the project schedule.

41. Provide BIM services as detailed in spec section 013700 BIM Execution Plan.
    a. Even if this contract is not shown to have responsibilities in the BIM execution and coordination, this contract is to include providing a representative at a minimum of six (6) BIM Coordination meetings.

42. BIM Coordination : This contractor will include $700 in their bid proposal to pay for the licensing agreement with Revizto for BIM Coordination of all trades.

43. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 60 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

44. Provide a $25,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-06 - CARPENTRY AND GENERAL WORK

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 061000	Rough Carpentry
Section 062000	Finish Carpentry
Section 080671	Door Hardware Schedule
Section 081113	Hollow Metal Doors and Frames
Section 081416	Flush Wood Doors
Section 083323	Overhead Coiling Doors
Section 087100	Door Hardware
Section 101100	Visual Display Units
Section 10 14 00	Signage
Section 101419	Dimensional Letter Signage
Section 102113.19	Plastic Toilet Compartments
Section 102123	Cubicle Curtains and Track
Section 102239.13	Folding Glass-Panel Partitions
Section 102600	Wall and Door Protection
Section 102800	Toilet, Bath, and Laundry Accessories
Section 104400	Fire Protection Specialties
Section 105126	Plastic Lockers
Section 105613	Metal Storage Shelving
Section 107316.13	Metal Canopies
Section 111313	Loading Dock Bumpers
Section 113013	Residential Appliances
Section 116623	Gymnasium Equipment
Section 11 72 00	Examination And Treatment Equipment
Section 11 73 11	Patient Lifts
Section 122400	Window Shades

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide labor and materials to perform the work related to all carpentry and general work.

2. All rough carpentry related to the exterior skin of the building including wood nailers and blocking. This Contract A-06 : Carpentry is to provide wood blocking at the exterior walls including wood nailers and blocking for windows, doors, louvers, sills, and other openings. This contract to also provide all blocking integral to the roof and wall assemblies (including but not limited to roof parapet blocking, roof blocking, roof curbs blocking, blocking at the mansards, and blocking at curbs). Plywood sheathing at exterior walls is to be provided by

Contract A-13 : Metal Studs & Drywall.

a. This contractor to coordinate with roof design and provide sufficient wood blocking to meet designed thickness of roof and insulation based upon required slopes. No additional funds will be provided for additional blocking based upon roof thickness.

3. All rough carpentry related to the interior of the building including blocking, wood nailers, etc. for the installation of fire extinguishers, railings, doors, windows, toilet accessories, cabinets, toilet partitions, casework, millwork, markerboards/tackboards, televisions/monitors, gym equipment, etc. including fire treating, as required. Include whether or not shown on project documents.

4. Install hollow metal, acoustical metal doors, integrated door opening assemblies, and wood doors, frames, vision panels, and finish hardware (Including receipt of doors, frames, and hardware at the curb side) Contract A-11 : Doors Frames Hardware Supply will be furnishing the doors, frames, and hardware. Install Key Control Cabinet.

5. Provide Knox boxes to be installed at the building entrances where required by local fire department.

6. Install finish hardware at hollow metal, integrated door opening assemblies, acoustical metal doors, and wood doors. Hardware to be supplied by Contract A-11: Doors Frames Hardware Supply will and installed by this Contract A-06. This Contract A-06 is responsible for coordinating door hardware with their work to ensure each opening is properly prepped for hardware being supplied by Contract A-11 : Doors Frames Hardware Supply. All low voltage wiring within the doors and frames is to be installed by this contract A-06. Conduits and raceways within walls by the electrical contractors. Electrical contractor to install power supply and make final power connections. Final connections of low-voltage wiring to hardware to be provided by special systems contractor.

7. This contractor to accept curbside delivery and perform and document an inventory of all doors frames and hardware. Doors, frames, and hardware are to be stored in a locked classroom designated by the construction manager. This contract A-06 is to advise immediately on any missing or damaged materials in the inventory.

8. Install hold open closers with fire alarm interface: Power wiring by Electrical Contractor. Fire alarm ties in by Electrical Contractor.

9. Coordinate card reader requirements with electrical hardware.

10. Provide overhead coiling doors and coiling grills.

11. Provide exterior metal canopies. Include delegated-design.

12. Keying coordination for all lock sets (Hollow Metal, Wood Doors, Overhead Doors & Grilles, Aluminum Entrances). Replace all construction cylinders with permanent cylinders. Install key control cabinet and organize keys according to this key control system.

13. Coordinate electrical requirements with any automatic door operations (include overhead). Provide low-voltage wiring required for overhead doors and grilles and automatic door operations.

14. Provide field assistance to Electrical and Glazing Contractors.

15. All field trimming required to adjust to existing conditions.

16. Provide coat hooks, as specified in Section 062000, mounted on 1x10 (nominal) poplar backboard with beveled edges, painted to match adjacent surfaces.

17. Provide adjustable shelving (shelves, brackets, standards).

18. Install smart televisions and brackets provided by owner.

19. Provide Architectural Louvers and grilles.

20. Provide Residential appliances, include all hardware for complete connection to utilities.

21. Provide gymnasium wall padding and hardware (gymnasium equipment). Provide cutouts for all wall mounted devices.

22. Provide GFRC decorative columns and cornices. Provide caulking of GFRC column covers cornices to adjoining materials. Provide primers, bond breakers, and joint backers. Clean, prime, and prepare surfaces before application of caulks and sealants in accordance with specifications and manufacturer's recommendations.

23. Provide architectural metal column covers.

24. Provide exterior PVC railings.

25. Provide new vertical wheelchair lifts complete. Electric service and disconnect switch for the lifts are the responsibility of the Electrical Contractor. All other control wiring, as specified, will be the responsibility of this Contractor.

26. Provide Lift Equipment in Restrooms and Nurses Areas.

27. Provide all examination and treatment equipment.

28. Provide all cubicle curtain and track assemblies.

29. Anchoring devices, fasteners, inserts and other related items associated with the installation of the above items.

30. Provide plywood covers on at all diamonds where steel columns are to be installed. These

covers shall be installed immediately following the placement of concrete slabs on grade. Remove and dispose of plywood covers following installation of concrete within the diamonds.

31. Provide temporary wood safety barricades including toe-kicks at all floor and roof openings.

32. Provide and maintain temporary wood railing and handrail at stairs. Provide wood infill of stair and landing pans.

33. Provide an exterior located temporary scaffold-stair system to provide access to all floors and the roof from grade. Scaffold is to be raised above the roof parapet with an extended landing to provide safe access and egress to the roof. Roof landing is to be installed utilizing screw jacks to allow the support to be modified during roof installation. Bottom floor of scaffold is to be provided with 8' tall plywood walls around the perimeter and a plywood door with hinges and a hasp for locking. Access is to be maintained until contractor is directed to remove by EDiS. Provide additional similar scaffolding on top of the roof to access all roof elevations. Include removal at the request of EDiS.

34. Provide screening around perimeter of all floors above ground level for falling object protection. Screening shall be erected from the walking/working surface or toe-board to the top of a guardrail system's top rail, for a distance sufficient to protect employees below. The material shall be designed and manufactured with a specialized double-strand configuration, as well as an ultraviolet protective coating. It shall be designed to withstand wind, rain, sun, and other potentially hazardous environmental conditions, and shall be compliant with all applicable OSHA 1926 Subpart M regulations. The netting shall have a Reinforced border with a Flame Retardant coating, UV resistant, orange in color and a minimum of 48 inches (4') in height. Openings in netting shall not exceed ¼ inch.

35. Provide wood safety barricades to extend top of roof parapets to OSHA required height during construction. Coordinate removal and replacement of wood safety barricades with metal wall cap installation.

36. Provide wood blocking as needed in the mock-up wall installation (1 mock-up wall per bid package for a total of 2 mock-up walls to be constructed).

37. Demolish and remove all temporary installations (excluding mock-up wall installation by Sitework contractor).

38. This Subcontractor shall at a minimum provided, maintained, and inspected for the length of the project, one temporary fire extinguisher for each 3,000 sq. ft of the protected building area. Travel distance from any point of the protected area to the nearest fire extinguisher shall not exceed 100 feet. In multistory buildings, at least one fire extinguisher shall be located adjacent to stairway. Fire extinguishers shall be at least 10lb, Multi-Purpose (ABC) dry chemical, UL labeled, with a rating of 3a:40bc.

39. Provide temporary weather protection in all window and door openings at the exterior walls. Protection is to consist of wood blocking and reinforced poly with 8' tall plywood at first floor

levels. Provide wood barricades with plywood door and locking hasp at all first floor door openings.

40. Provide wood blocking as needed in the mock-up wall installation.

41. Provide all specialties listed within this contract.

42. Provide all wood wall panel and acoustic wood wall panel system assemblies. Include all accessories, hardware, trim, furring strips, mineral wool, etc.

43. Provide White boards, Markerboards (including glass markerboards), Chalk boards, tack boards, and tack strips. Provide tackable wall panels. Include any blocking required on the face of the wall to maintain a level mounting surface with the tile wainscot.

44. Provide Display cases.

45. Provide Projection screens. Electric service is the responsibility of the Electrical Contractor. All other control wiring, as specified, will be the responsibility of this Contractor.

46. Provide Lockers. Coordinate base requirements with Contract A-03 : Concrete. Provide locker room benches.

47. Provide dock bumpers and loading dock equipment.

48. Provide wardrobe and closet specialties. Wall mounted hooks to be provided by the carpentry contractor.

49. Provide Fire extinguishers, cabinets and accessories.

50. Provide fire blanket cabinets.

51. Provide operable partitions, folding partitions and cubicle curtains. Coordinate any structural requirements with the structural steel and carpentry contractors. Provide all supplementary steel as needed to hang partitions from structural support steel, provided by the Structural Steel Contractor. It is assumed, no additional steel will be required below structural support steel. If so, it will be provided by this contractor.

52. Provide Signage (interior and exterior). Provide plaques.

53. Provide Toilet partitions. Coordinate any structural requirements with the structural steel contractor. Include any blocking required on the face of the wall to maintain a level mounting surface with the tile wainscot.

54. Provide Toilet and bath accessories.

55. Provide all classroom accessories: tackboards, whiteboards, paper towels, soap dispensers.

56. Provide Mirrors (both framed and frameless). Include any blocking required on the face of the wall to maintain a level mounting surface with the tile wainscot.

57. Provide hand dryers, including the stainless steel panels beneath each hand dryer.

58. Provide wall and corner protection. Including FRP Paneling.

59. Provide defibrillators and cabinets. A total of 4 are required.

~~60. Provide goggle cabinets as specified in Section 104400.~~

61. All materials provided under this contract are to be stored by this contractor until delivery is requested. Material to be delivered to the site and off loaded by this contractor's forces. Deliveries to correspond to the construction schedule. Provide 48 hour notice prior to delivery.

62. In addition to the insurance specified in Section 006216, this contractor will provide Pollution Insurance, with limits of $2,000,000 per occurrence and $2,000,000 aggregate.

63. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

64. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. CSD and EDiS will not be responsible for any lost tools, materials or equipment.

65. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

66. Contractor must provide additional crews as needed to maintain the project schedule.

67. Provide BIM services as detailed in spec section 013700 BIM Execution Plan.
    a. Even if this contract is not shown to have responsibilities in the BIM execution and coordination, this contract is to include providing a representative at a minimum of six (6) BIM Coordination meetings.

68. BIM Coordination : This contractor will include $700 in their bid proposal to pay for the licensing agreement with Revizto for BIM Coordination of all trades.

69. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 60 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

70. Provide a $50,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-07 – ROOFING

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 074113	Metal Roof Panels
Section 075419	Polyvinyl-Chloride Roofing
Section 076200	Sheet Metal Flashing and Trim
Section 077100	Roof Specialties
Section 077123	Manufactured Gutters and Downspouts
Section 077200	Roof Accessories
Section 078400	Firestopping
Section 079200	Joint Sealants

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide all roofing systems, including rigid and tapered insulation and all related accessories.

2. Provide standing seam roofing system.

3. This Subcontractor shall carefully review the edge of roof details to determine if the roof can be placed before the exterior wall assembly is complete. This Subcontractor shall include all costs associated with returning to the jobsite to complete the roof perimeter after wall assembly is complete.

4. Caulking related to roofing, flashing and roof accessories.

5. Provide waterproof seals around lightning protection system as required by roof manufacturer requirements. If locations of lightning protection conduits are not clearly shown on the roof plan, include an allowance to seal one penetration for every 1000 sf of roof area.

6. Roof drains and associated plumbing shall be provided by the Plumbing Subcontractor. Flashing of the roof drains shall be by the Roofing Subcontractor. Openings for the roof drains in the roofing materials shall be cut by the Roofing Subcontractor. Openings in the metal deck shall be cut by others.

7. Provide all metal copings, fascias, and caps.

8. Roof hatches, including associated roof curbs.

9. Provide Walk pads.

10. Provide Metal drip edges.

11. Provide Gravel stops.

12. Provide flashing and associated work at Roof curbs provided by others to maintain watertightness and roof warranty.

13. Provide expansion joints that are integral to the roof.

14. Provide all Gutters, down spouts, scuppers, and splash pans.

15. Wood blocking shall be provided by others.

16. Provide Flashing and sheet metal.

17. Provide all skylights and curbs.

18. Complete waterproofing of all penetrations by others. This includes the following at minimum: boots, witches hats, flashing details, pitch pockets, sealants.

19. Flashing Summary:
    a. Provide all thru-wall and cavity flashing within masonry walls no matter the substrate: by the Masonry Contractor.
    b. 2-piece receiver flashing to be installed in masonry walls shall be supplied by the Roofing Contractor to the mason for installation.
    c. Roofing contractor to provide flashing between termination of metal wall panels and EPDM roofing.

20. Contractor must provide additional crews as needed to maintain the project schedule.

21. In addition to the insurance specified in Section 006216, this contractor will provide Pollution Insurance, with limits of $2,000,000 per occurrence and $2,000,000 aggregate.

22. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

23. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

24. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

25. BIM Coordination : This contractor will include $700 in their bid proposal to pay for the licensing agreement with Revizto for BIM Coordination of all trades.

26. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 60 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

Provide a $20,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-08 – WATERPROOFING

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 071113	Bituminous Dampproofing
Section 072500	Weather Barriers
Section 079200	Joint Sealants

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide Foundation waterproofing and Bituminous DampproofingProvide waterproofing at all foundations walls (including at inner courtyards). Include costs to install foundation waterproofing in two visits. First visit to install waterproofing up to slab elevation, second visit to return to install remaining waterproofing up wall above slab-on-grade after exterior wall framing and sheathing is installed.

2. Provide fluid applied vapor barrier and water resistive barrier on outside face of exterior walls applied at all locations where shown (vertical and horizontal) behind vertical brick, metal, and stone surfaces and over CMU back-up and exterior sheathing board. This includes all exterior sheathing. Include termination angles as needed for the insulation installation.

3. Contractor must provide additional crews as needed to maintain the project schedule.

4. In addition to the insurance specified in Section 006216, this contractor will provide Pollution Insurance, with limits of $2,000,000 per occurrence and $2,000,000 aggregate.

5. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

6. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

7. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

8. Provide pricing for all alternates as described in Section 012300-Alternates.

b. Contractor is to guarantee all alternate pricing for 60 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

9. Provide a $5,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-09 - EXTERIOR METAL PANELS

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 054000	Cold-Formed Metal Framing
Section 072100	Thermal Insulation
Section 074213	Metal Wall Panels
Section 076200	Sheet Metal Flashing and Trim
Section 078400	Firestopping
Section 079200	Joint Sealants

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide metal wall panels and zee furring channels and include all necessary anchoring devices.

2. Provide metal wall panels at underside of entrance canopies. Include any supplemental framing, zee furring channels and include all necessary anchoring devices. Include metal wall flashing where metal panels meet the exterior wall.

3. Coordinate penetrations through metal wall panels with other contractors and cut and seal metal panels around penetrations to provide a finished look as part of the metal wall panel system.

4. Provide Flashing of panels integral with the panel system.

5. Provide Caulking of panels integral to the panel system. Caulking at the perimeter of the metal wall panel system and adjoining materials to be provided by Contract A-10 : Joint Sealants.

6. Miscellaneous metal items necessary to support panels other than required structural steel.

7. Furnish anchorage items for embedding into other construction for support of panels.

8. Touch up of all welding.

9. Provide Galvanized, epoxy or stainless steel, etc. anchors as specified.

10. Provide metal fascias related to the panel system. Copings at the top of the roof parapet to be provided by Contract A-07 : Roofing.

11. Provide Waterproofing and insulation integral to the panel system.

12. This Subcontractor shall coordinate his shop drawings with the Window Subcontractor's shop drawings.

13. Verification of field dimensions is the responsibility of this Subcontractor.

14. Contractor must provide additional crews as needed to maintain the project schedule.

15. In addition to the insurance specified in Section 006216, this contractor will provide Pollution Insurance, with limits of $2,000,000 per occurrence and $2,000,000 aggregate.

16. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

17. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

18. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

19. Provide BIM services as detailed in spec section 013700 BIM Execution Plan.

20. BIM Coordination : This contractor will include $700 in their bid proposal to pay for the licensing agreement with Revizto for BIM Coordination of all trades.

21. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 90 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

10. Provide a $10,000 allocation to be used at the discretion of the Construction Manager.

11. Provide coordinated mock-up system.

CONTRACT NO. A-10 – JOINT SEALANTS

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification Sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 07 84 00	Firestopping
Section 079200	Joint Sealants

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide all joint sealants throughout the project

2. Provide caulking or sealants at the following locations, both interior and exterior, as shown on the drawings or as described in the specifications:

   a. Masonry (i.e. brick, block, stone, cast stone, pre-cast concrete) to adjoining materials
   b. Masonry to masonry
   c. Hollow metal frames to adjoining materials including at base of door frames to floor.
   d. Interior aesthetic caulk bead of exterior windows to adjacent materials (drywall, sills, etc.). Perimeter of all interior windows and storefronts, to adjoining materials.
   e. Concrete slab control joints, expansion joints, isolation joints, and perimeter slab joints
   f. Exposed non-fire rated drywall to adjoining materials
   g. Vented painted metal soffit to adjoining materials
   h. Metal Wall Panels to adjoining materials.
   i. Column covers to adjoining materials
   j. Ceramic Tile Walls and floors to adjoining materials.

3. Examine the areas and conditions where joint sealers are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

4. Provide primers, bond breakers, and joint backers. Clean, prime, and prepare surfaces before application of caulks and sealants in accordance with specifications and manufacturer's recommendations.

5. Provide mock-ups. Provide adhesion test for exterior caulk.

6. Provide caulking required for mock-up wall construction.

7. Provide custom colors of caulks and sealants

8. The following caulking or sealants are furnished and installed by others:
   a. Fire and acoustical sealants associated with drywall partitions will be by the Metal Studs & Drywall Contractors
   b. Fire and acoustical sealants associated with masonry partitions will be by the Masonry Contractors
   c. Fire and acoustical sealants associated with mechanical, electrical, plumbing, fire protection, and communications systems is by the Contractor who made the penetration.
   d. Caulking and sealants associated with roofing
   e. Caulking of mechanical, electrical or plumbing fixtures and equipment will be by the Contractor installing the fixture or equipment
   f. Caulking of casework and trim by installer
   g. Caulking or sealants integral/within windows, storefronts, curtain walls.
   h. Caulking of joints in ceramic tile walls and flooring will be by the installer
   i. Caulking or sealants between all exterior windows, storefronts, and curtainwalls and adjacent surfaces.

9. Protection of adjacent surfaces.

10. Clean up.

11. Attic stock.

12. Contractor must provide additional crews as needed to maintain the project schedule.

13. In addition to the insurance specified in Section 006216, this contractor will provide Pollution Insurance, with limits of $2,000,000 per occurrence and $2,000,000 aggregate.

14. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

15. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

16. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be incorporated into the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

17. Contractor must provide additional crews as needed to maintain the project schedule.

18. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 90 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following

receipt of all bid packages.

19. Provide $5,000 allowance to be used at the discretion of the Construction Manager.

CONTRACT NO. A-11 - DOORS, FRAMES, AND HARDWARE SUPPLY

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 081113	Hollow Metal Doors and Frames
Section 081416	Flush Wood Doors
Section 080671	Door Hardware Schedule
Section 087100	Door Hardware
Section 088000	Glazing

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Furnish only hollow metal, integrated door opening assemblies, acoustical metal doors, and wood doors, frames, vision panels, finish hardware

2. Do not include supply of aluminum entrances. Supply finish hardware for all entrances (hollow metal, wood, and sound control). FRP and aluminum entrance hardware will be supplied by Contract A-12 : Glass & Glazing. Turn over all other hardware to Contract A-06 : Carpentry & General Works on site for installation in hollow metal and wood entrances.

3. Supply Automatic Door Operators as specified in the hardware schedule.

4. Supply hold open closers with fire alarm interface: Power wiring by Electrical Contractor. Fire alarm ties in by Electrical Contractor.

5. Keying. All lock sets, including aluminum and FRP. Provide Owner with copy of pin schedule. Provide key control cabinet as specified.
    a. Provide new cylinders for overhead doors, coiling doors, and sliding fire doors keyed to master system.

5. Construction cylinders.

6. All material to be stored by this Subcontractor until delivery is requested. Material to be delivered to the site and off loaded by others.

7. Deliveries to correspond to the construction schedule.

8. Provide field assistance to Electrical, Special Systems, Glazing, and Carpentry Contractors.

9. Coordinate electrical requirements with any automatic door operations.

10. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

11. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

12. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

13. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 90 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages."

18. Provide a $5,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-12 – GLASS AND GLAZING

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 076200	Sheet Metal Flashing & Trim
Section 079200	Joint Sealants
Section 080671	Door Hardware Schedule
Section 081613	Fiberglass Doors
Section 083400	Surface Mounted Sliding Door System
Section 084229	Automatic Entrances
Section 084313	Aluminum-Framed Storefronts
Section 085653	Security Windows
Section 086300	Metal Framed Skylights
Section 087100	Door Hardware
Section 088000	Glazing
Section 102239.13	Folding Glass-Panel Partitions

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide windows, curtain wall, FRP, storefront, glass and glazing systems.
    a. Provide perimeter trim at windows and storefronts with receiver piece for perimeter caulk bead (minimum 3/8" deep). If not included in factory supplied trim, include frame extenders to provide this receiver for caulk.

2. Provide manual aluminum door systems and handling.

3. Provide all folding glass-panel partition systems.

4. Provide automatic aluminum door systems and associated hardware including automatic door operators.

5. Provide Aluminum Doors, frames, and hardware. Include Construction Cores. Final Keying for Aluminum doors will be supplied by Contract A-11 : Doors/Frames/Hardware Supply and installed by this Contract A-12. This Contract A-12 is responsible for coordinating door hardware with their Aluminum entrances to ensure each opening is properly prepped for hardware. All low voltage wiring within the aluminum doors and frames is to be installed by this Contract A-12. Conduits and raceways within walls by the electrical contractors. Electrical contractor to install power supply and make final power connections. Final connections of low-voltage wiring to hardware to be provided by special systems contractor.

6. Provide Glazed Interior Wall and Door Assemblies including hardware.

7. Provide spandrel panels and associated insulation behind the panels.

8. Provide all glass and glazing at the interior and exterior of the building.

9. Provide Interior door, partition, vision panel and window glass.

10. Provide safety and security films where indicated.

11. Provide all applied window graphics.

12. Provide Caulking related to interior glazing.

13. Supply Automatic Door Operators as specified in the hardware schedule.

14. Provide all sealants integral to windows, storefronts, and curtain wall systems. This contract A-12 : Glass and Glazing is to provide all sealants (primary and secondary) between all exterior windows, storefronts, and curtainwalls and adjacent surfaces prior to installation and finishing of interior drywall. The aesthetic bead of caulk from the inside face of exterior windows, storefront, and curtainwalls A-10 : Joint Sealants. The sealants must be smoke, fire or sound rated depending on the adjacent wall construction.

    Sealants between all interior set windows and storefronts and adjacent materials is to be provided by Contract A-10 : Joint Sealants.

15. Do not provide interior hollow metal or hardware. These items will be provided by others.

16. Coordinate glass types with partition and door fire ratings. Contact Construction Manager with any discrepancies.

17. Provide windows for mock-up wall including flashing and accessories required to provide a complete installation

18. Provide Custom break metal trim and infill.

19. Hoisting/scaffolding related to the work of this Contract.

20. Coordinate edge of slab tolerances and field verify all rough openings.

21. Provide delegated design, data and submittal information related to the Scope of this Contract signed and sealed by a Professional Engineer as required by the Contract Documents.

22. Contractor must provide additional crews as needed to maintain the project schedule.

23. In addition to the insurance specified in Section 006216, this contractor will provide Pollution

Insurance, with limits of $2,000,000 per occurrence and $2,000,000 aggregate.

24. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

25. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

26. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

27. Provide BIM services as detailed in spec section 013700 BIM Execution Plan.

28. BIM Coordination : This contractor will include $700 in their bid proposal to pay for the licensing agreement with Revizto for BIM Coordination of all trades.

29. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 90 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages."

34. Provide a $15,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-13 – METAL STUDS AND DRYWALL

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 054000	Cold-Formed Metal Framing
Section 054400	Cold-Formed Metal Trusses
Section 061000	Rough Carpentry
Section 072100	Thermal Insulation
Section 072500	Weather Barriers
Section 078400	Firestopping
Section 079200	Joint Sealants
Section 083100	Access Doors and Panels
Section 092116	Gypsum Board Assemblies
Division 21	Fire Protection
Division 22	Plumbing
Division 23	Mechanical
Division 26	Electrical

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide metal studs, insulation, gypsum wallboard, exterior sheathing (plywood, densglass, asphalt fest, Tyvek, etc), taping, spackling, plaster and stucco.
    a. Contractor is to include providing and finishing moisture resistant drywall at the top of all interior walls prior to roof completion to allow for installation of ductwork.

2. Provide all metal stud and cold-formed metal stud walls, partitions, ceilings, parapets, soffits, headers, etc.

3. Provide all acrylic modified finish and vapor barrier systems at exterior walls and soffits.

4. Provide all metal stud framing required to back up EIFS, brick, etc.

5. Provide all bullet-resistant panel assemblies.

6. Provide all cold formed steel truss assemblies. Include delegated design.

7. Provide Engineered shop and installation drawings.

8. Provide structural stud assembly for the exterior skin of the building.

9. Frame openings in stud walls for all duct penetrations. Utilize the coordinated BIM model and/or approved duct shop drawings.

10. Provide metal furring. Zee furring channels supporting the metal wall panels is to be provided by Contract A-09.

11. Provide structural metal stud back-up wall for the mock-up wall.

12. Provide air barrier, water resistive barrier, and insulation on outside face of exterior walls where spray polyurethane foam insulating air barrier is not indicated.

13. Provide water resistive barrier sheet on exterior walls under exterior cladding where indicated.

14. Steel stud construction related to the roof parapet construction and roof screens.

15. Steel stud construction related to framing out for openings in exterior walls.

16. Provide secondary support framing.

17. Clips, anchors, supports and other accessories that interface between steel framing and steel studding.

18. Provide Wall sheathing (densglass & Plywood), asphalt felts and Tyvek on structural steel studs.

19. Provide Batt insulation, both thermal and acoustical and related work.

20. Provide the complete "TYPICAL PARTITION HEAD TERMINATION DETAIL(S)" assemblies shown on A-501.

21. Provide the complete "1HR RATED CELING @ LAUNDRY ROOM (153B, 155A)" detail shown on A-501.

22. Provide Plaster and stucco systems.

23. Include molded shapes.

24. Provide cementitious backer board for the wall tile installations.

25. Caulking of exposed non-fire rated drywall to adjoining materials to be provided by Contract A-10 : Joint Sealants.

26. Provide all acoustical sealants, smoke sealants, firesafing fire stopping, and fire continuous sealant at top and bottom of drywall walls as shown on the Partition Types drawings. Also include steel penetrations through drywall walls. Include fire taping and sealing at perimeter edge and as shown on the Drawings. Provide fire resistant joint systems at floors and walls.

Provide fire barrier at perimeter of slabs-on-deck where they meet either exterior wall systems or curtainwall systems.

27. Provide Exterior Insulated Finish System (EIFS) including all exterior metal studding, insulation, gypsum board, Tyvek, and reglets/trim as shown on drawings.
    a. Provide EIFS as field applied or panelized.
    b. Caulking of the following:
        i. EIFS to EIFS
        ii. EIFS to Masonry
        iii. EIFS to Aluminum
    c. Provide Flashing required at EIFS system.
    d. Rough blocking built into panelized EIFS is the responsibility of the EIFS Contractor.
    e. Anchors for supporting EIFS panels.
    f. Hoisting and scaffolding as required.
    g. Provide scoring, beads and joints as required and as detailed on the contract documents.

28. Provide exterior PVC trim. Ensure all installations are completed per manufacturer specifications. All trim is to be screwed and capped, no nailing of PVC trim allowed. Provide of exterior PVC trim to adjoining materials. Provide primers, bond breakers, and joint backers. Clean, prime, and prepare surfaces before application of caulks and sealants in accordance with specifications and manufacturer's recommendations.

29. Install Access panels furnished by others.

30. Include filling of all interior hollow metal door frames in drywall where required.

31. Include fire taping and sealing at perimeter edge and as shown on the Drawings.

32. Provide fire resistant joint systems at floors and walls. Include fire barrier between perimeter of floor slabs and exterior assembly.

33. Provide All Corner Guards where integral to the drywall wall assembly.

34. Provide all expansion systems (excluding those integral to the roof assembly which will be provided by Contract A-07 : Roofing). 2-hour fire rated expansion joints for masonry-to-masonry as seen on is to be provided by Contract A-04 : Masonry.

35. Provide Adjustable Partition Closure: Gordon Inc. Window Mate Series 40 Plus

36. Scaffolding and lifts for this work.

37. No power for welding equipment will be provided.

38. Comebacks and out-of-sequence work may be required and as such should be included.

39. Include all necessary field measurements.

40. Inlcude point-up of gypsum walls and ceilings following first coat of finish paint.

41. Include two (2) passes per floor to "touch-up" mechanical penetrations to ensure ratings required. The first pass will be required prior to ceiling grid installation and the second pass will be required prior to final inspection for Certificate of Occupancy.

42. Include costs to return to rooms following drywall installation and finishing on walls to install and finish drywall at window jambs, heads, sills after storefront, window, curtainwall installation is complete.

43. Bidders are advised to pay particular attention to top of wall conditions, fire and smoke safing of slabs and acoustical sealants.

44. Contractor must provide additional crews as needed to maintain the project schedule.

45. In addition to the insurance specified in Section 006216, this contractor will provide Pollution Insurance, with limits of $2,000,000 per occurrence and $2,000,000 aggregate.

46. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

47. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. CSD and EDiS will not be responsible for any lost tools, materials or equipment.

48. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

49. Provide BIM services as detailed in spec section 013700 BIM Execution Plan.

50. BIM Coordination : This contractor will include $700 in their bid proposal to pay for the licensing agreement with Revizto for BIM Coordination of all trades.

51. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 180 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

52. Provide a $30,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-14 - CASEWORK AND MILLWORK

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 062000	Finish Carpentry
Section 064100	Architectural Wood Casework
Section 079200	Joint Sealants
Section 123553.23	Solid-Plastic Laboratory Casework
Section 123600	Countertops
Section 123623.13	Ballistic Rated Countertops

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide labor and materials to perform the work related to all casework and millwork.

2. Provide All field trimming required to adjust to existing conditions.

3. Provide All millwork, casework and trim. Including specialty casework.

4. Coordinate power and data requirements and locations with the electrical contractor for locations and sizes of holes needed.

5. Provide P-Lam adjustable shelving on metal brackets (shelves, brackets, standards).

6. Provide all sills and aprons (stools).

7. Provide plywood, wood trim, quartz paneling, wood veneer paneling, and plastic laminate veneer paneling.

8. Provide all countertops and backsplashes.

9. Provide Metal legs supporting countertops.

10. Provide Concealed Countertop Bracket wherever shown. Coordinate installation in wall prior to drywall installation.

11. Coordinate cutting holes in casework with other trades.

12. Coordinate blocking requirements with Contract A-06 : Carpentry & General Works.

13. Provide joint sealers integral to casework/millwork and to dissimilar materials.

14. Contractor must provide additional crews as needed to maintain the project schedule.

15. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

16. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

17. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

18. BIM Coordination : This contractor will include $700 in their bid proposal to pay for the licensing agreement with Revizto for BIM Coordination of all trades.

19. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 90 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

21. Provide a $5,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-15- CERAMIC TILE

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 079200	Joint Sealers
Section 093000	Ceramic Tiling

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide ceramic tile, porcelain tile, marble tile and thresholds.
2. Provide Porcelain pavers, etc.
3. Provide Setting beds.
4. Provide crack suppression membrane for this tile installation.
5. Provide expansion joints and sealants as required per manufacturers' installation instructions.
6. Provide waterproofing and anti-fracture membrane at all tile locations as specified by the project documents.
7. Provide tile border around mirrors, switches/receptacles, specialties, etc that are located half in and half out of wainscot height.
8. Provide metal trim pieces (schluter strips, etc.) integral to the tile installations. Size Schluter strips according to the tile thickness to ensure no sharp edges of tile are not visible/touchable.
9. Provide metal strips installed as part of the tile installation.
10. Provide vapor retarding sealer prior to tile application.
11. Grout.
12. Provide grout sealant according to manufacturer's directions.
13. Cutting and fitting around work installed by others.
14. Patching and leveling. The cost of this work will be taken out of the contract allocation.

15. Provide cleaning, waxing and protection. Protection will be with reinforced kraft paper, cardboard, or masonite. Provide protection of finished products until acceptance by Construction Manager.

16. Attic stock.

17. Contractor must provide additional crews as needed to maintain the project schedule.

18. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

19. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

20. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

21. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 90 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

21. Provide a $15,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-16 - ACOUSTICAL CEILINGS

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 072100	Thermal Insulation
Section 083100	Access Doors and Panels
Section 095100	Acoustical Ceilings
Section 095423	Linear Metal Ceilings
Section 098430	Sound-Absorbing Wall and Ceiling Units

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide acoustical panel ceilings, suspension system and hangers.

2. Provide all suspended ceiling systems.

3. Provide all linear metal ceiling systems.

4. Acoustical lay in insulation blankets above ceiling where required by Specifications or Drawings.

5. Supplemental suspension hangers at large ducts above ceilings and at openings for lighting fixtures.

6. Continuous acoustical sealant on back of vertical leg before installing moldings where required by the project documents.

7. Furnish and install hold down clips where required by governing regulations for fire resistant ratings.

8. Provide acoustical wall treatments, sound absorbing wall units, and fabric covered acoustical panels

9. Provide Expansion joints integral to ceiling systems. Include per manufacturer requirements, even where not shown indicated on project documents.

10. Reflected ceiling layout, including field verification of existing conditions. Inform the Construction Manager if existing conditions differ from Drawings and Specifications.

11. This Subcontractor shall cut openings in ceilings for sprinkler heads, lights, mechanical diffusers and grilles, etc.

12. Attic stock.

13. Contractor must provide additional crews as needed to maintain the project schedule.

14. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

15. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

16. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

17. Provide BIM services as detailed in spec section 013700 BIM Execution Plan.

18. BIM Coordination : This contractor will include $700 in their bid proposal to pay for the licensing agreement with Revizto for BIM Coordination of all trades.

19. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 90 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

18. Provide a $15,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-17 - PAINT AND WALLCOVERINGS

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 079200	Joint Sealants
Section 099000	Paints and Coatings
Division 22	Plumbing
Division 23	Mechanical
Division 26	Electrical

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide all painting and vinyl or fabric wall covering (all walls and ceilings indicated on the finish schedule).

2. Provide all wall coverings and "applied wall graphics".

3. Paint all exposed block work and concrete work as shown on the room finish schedule and required by the specifications. Include cleaning and prep of these surfaces prior to painting.

4. Prime, stain or seal all wood trim and doors.

5. Clean, Prime, and Seal exposed concrete slabs where shown.

6. Paint Steel Lintels above doors and windows both interior and exterior.

7. Paint exposed piping, ductwork, and equipment (sprinkler, plumbing, electrical) in accordance with the Drawings and Specifications. Include exterior coating for exposed piping and ductwork on roof and in Utility Yard.

8. Paint exposed ceilings and structures in accordance with the Drawings and Specifications.

9. Provide supplementary ventilation as required in enclosed spaces.

10. Paint all hollow metal frames and doors as shown on the door schedule. Paint all hollow metal window frames. Inlcude light sanding of all hollow metal frames, as needed, prior to painting. Include caulking of frames to adjacent surfaces included flooring.

11. Paint metal stairs and railings.

12. Provide labeling of fire rated walls as required by IBC as stated below:
    a. Where there is an accessible concealed floor, floor-ceiling or attic space, fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with stenciling in the concealed space. Such identification shall:
        i. Be located within 15 feet (4572 mm) of the end of each wall and at intervals not exceeding 30 feet (9144 mm) measured horizontally along the wall or partition.
        ii. Include lettering not less than 3 inches (76 mm) in height with a minimum 3/8-inch (9.5 mm) stroke in a contrasting color incorporating the suggested wording, "FIRE AND/OR SMOKE BARRIER—PROTECT ALL OPENINGS".

13. Prefinished items will not be painted by this Subcontractor, unless otherwise noted.

14. Paint all semi-exposed wood blocking as indicated on the drawings.

15. Provide all wall mounted way finding stripes.

16. Protection of adjacent surfaces.

17. Minor patching prior to application of finishes.

18. Clean up.

19. Attic stock.

20. Final coat of paint is to be installed after ceilings are installed, if directed by Construction Manager.

21. Contractor must provide additional crews as needed to maintain the project schedule.

22. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

23. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

24. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

25. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 90 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt

of all bid packages.

30. Provide a $30,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-18 – FLOORING

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 090561	Common Work Results Flooring Prep
Section 096500	Resilient Flooring
Section 096566	Resilient Athletic Flooring
Section 096800	Carpeting
Section 124813	Entrance Floor Mats and Frames

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide flooring in accordance with the finish schedule and specifications.

2. Prepare subfloor for finished flooring including leveling and patching. Base bid shall include all flashing patching and surface preparation required to perform the work of this Contractor.

3. Provide all resilient flooring and base systems.

4. Provide all resilient athletic flooring (RAF) and base systems.

5. Provide all carpeting.

6. Provide vinyl, rubber, and resilient bases as detailed on the finish schedule and plans. This includes the toe kicks at casework.

7. Provide all transitions and reducer strips at edges of flooring.

8. Provide cleaning, waxing, and protection. Protection will be with reinforced kraft paper, cardboard, or Masonite

9. Provide all walk-off-mats (WOM).

10. Provide rubber and vinyl stair treads and risers. Provide rubber and vinyl nosings. Provide rubber tiles at landings. Include Schluter metal trim.

11. Seaming diagrams.

12. Attic stock.

13. Contractor must provide additional crews as needed to maintain the project schedule.

14. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

15. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

16. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

17. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 90 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

17. Provide a $15,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-19 : FLUID-APPLIED FLOORING

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials, and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Division 3	Concrete
Section 079200	Joint Sealants
Section 090561	Common Work Results Flooring Prep
Section 096700	Fluid-Applied Flooring

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide fluid-applied flooring and integral base.

2. Provide mock-ups as required by plans and specifications.

3. Provide vapor retarding sealer prior to resinous floor application, as required by specifications or manufacturer's installation instructions.

4. Cutting and fitting around work installed by others.

5. Patching and leveling.

6. Provide cleaning, waxing and protection. Protection will be with reinforced kraft paper, cardboard, or Masonite. Provide protection of finished products until acceptance by Construction Manager.

7. Provide crack suppression membrane for this epoxy installation as required by the project documents.

8. Include all control joints and expansion joints per manufacturer requirements and project details.

9. Provide metal strips installed as part of the epoxy installation.

10. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

11. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

12. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

13. Contractor must provide additional crews as needed to maintain the project schedule.

14. Provide pricing for all alternates as described in Section 012300-Alternates.

15. Provide $5,000 allowance to be used at the discretion of the Construction Manager.

CONTRACT NO. A-20 : KITCHEN EQUIPMENT

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification Sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 078400	Fire Stopping
Section 079200	Joint Sealers
Section 112100	Commercial Appliances
Section 114000	Foodservice Equipment
Division 21	Fire Protection
Division 22	Plumbing
Division 23	HVAC
Division 26	Electrical

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide food service equipment.
2. Provide all commercial appliances, including in Vocational Kitchen 161.

3. All final connections shall be made by the Electrical and Mechanical Contractors. Provide coordination with Special Systems, Electrical and Mechanical contractor to prevent any additional cost to the Owner.

4. Provide the labor, equipment and materials to uncrate, assemble, install in place, level & plumb and completely install all food service equipment with exception of electrical and plumbing installations which will be completed by others.

5. Any discrepancies between the Drawings, Specifications and site conditions or ambiguities in the documents shall immediately be reported to the Construction Manager in writing. Inconsistencies shall be corrected in writing or by reissuing the drawings. If the Contract Documents disagree with the quality or quantity of work required, the better quality or greater quantity shall be supplied unless otherwise instructed in writing by the Construction Manager. Any work performed by the Contractor at locations in question after his discovery of discrepancies, inconsistencies, ambiguities, or errors, without securing resolution, shall be at the Contractor's risk.

6. This Contractor shall verify all measurements at the site and assume full responsibility for their correctness before proceeding with his work. No extra compensation will be allowed because of differences between site conditions and those indicated on the drawings.

7. Manufactured articles, materials, and equipment shall be applied, installed, connected,

erected, used, cleaned and conditioned as directed by the manufacturer and shall be protected from damage until acceptance. Prefinished products which are damaged before or after installation shall be replaced with new and perfect materials. Materials finished after installation which are damaged shall be refinished or replaced as the Construction Manager may direct. No additional charge will be honored by the Construction Manager for repair or replacement of finished materials.

8. Should this Contractor feel that the Contract Documents call for work which he cannot guarantee, he shall so state, in writing, prior to bidding. Proceeding with any operation shall be construed as acceptance of all guarantee conditions.

9. Secure certificates of inspection and occupancy required by authorities having jurisdiction. Deliver copies of certificates to the Construction Manager prior to filing application for final payment.

10. It is this Contractor's responsibility to make certain statutes, building codes, and regulations including those of the appropriate health agencies having jurisdiction over this type of facility are met.

11. Provide protection of all equipment during and after installation has been completed.

12. Provide coordinated shop drawings that indicate all MEP requirements and accurately reflect the actual conditions and spacing of the area.

13. Provide specified warranties.

14. All foodservice components consist of those items identified in Section 114000 and the "FS" Series drawings that identify the Food Service items. All items are to be included in the base bid of this contract to completely provide all systems in their entirety. This contractor shall pay particular attention to the "Standard Details" section of typical drawings within Specification section 114000.

15. Welding of materials must comply with all specified acceptable means.

16. Any items furnished as part of this Scope of Work that require mechanical or electrical rough ins or services that are different from those shown on the Contract Drawings shall be so noted at the time of bid. Failure to do so shall make this Contractor liable for costs of any changes required by same.

17. Provide all caulking and sealants for proper installation and in accordance with public health regulations. Provide fire stopping of any penetrations created through smoke and fire partitions.

18. Provide startup, testing and demonstrate all equipment installed under this category of work. Provide proposed schedule, including names and telephone numbers of attending representatives at least (3) three weeks in advance of demonstration.

19. Obtain approvals and permits and coordinate inspections and testing with governing local and state agencies.

20. Provide licensed electrician to make all interconnections within equipment furnished by this contractor. This includes, but is not limited to, power and control wiring interconnecting the kitchen hoods and make-up air units provided by the mechanical contractors.

21. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

22. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

23. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be incorporated into the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

24. Contractor must provide additional crews as needed to maintain the project schedule.

25. Provide pricing for all alternates as described in Section 012300-Alternates.

26. Provide $10,000 allowance to be used at the discretion of the Construction Manager.

CONTRACT NO. A-21 : POOL EQUIPMENT

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification Sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Division 3	Concrete
Section 13 11 00	Summary Of The Swimming Pool Work
Section 13 11 13	Swimming Pool Shotcrete
Section 13 11 26	Exposed Aggregate Pool Finish (Enhanced Plaster)
Section 13 11 29	Ceramic Tile Swimming Pool Finish
Section 13 11 40	Pool Trench Drain
Section 13 11 41	Skimmer Recirculation System
Section 13 11 46	Swimming Pool Accessories
Section 13 15 10	Swimming Pool Caulking And Sealants
Section 13 15 90	Swimming Pool Heater
Section 13 34 13	Glazed Structures
Division 22	Plumbing
Division 23	HVAC
Division 26	Electrical
Division 31	Earthwork

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Furnish and install a complete swimming pool, as shown and/or specified, including but not limited to, general pool construction, structure, recirculation system, filtration system, water chemistry system, waterproofing membrane, finish on the interior of the pool, stainless steel perimeter pool recirculation system and piping, mechanical and deck equipment, filtration system, deck drain/gutter system around entire perimeter of pool, water treating, chemical feeding, testing, pool fittings, safety equipment, lights, cleaning equipment, painted pool water depth indicators, skimmer, mechanical piping systems, heater, supervision, start-up and operator training. The listing of the above items is not exhaustive, but is representative of the types of materials that the Subcontractor is expected to provide.
    a. Concrete contractor is to provide slabs-on-grade in Pool room to outside perimeter of deck drain (by plumber). All work within the perimeter of the deck drain is to be provided by this Contract A-22.

2. Provide excavation for swimming pool installation and associated equipment/piping.

3. Dewatering as required to install the complete pool system.

4. Equipment bases and housekeeping pads.

5. Provide the new pool chair lift (not refurbish existing).

6. Provide all pool deck equipment and pool safety equipment.

7. Provide all sealants.

8. Start-up of pool system, monitoring, testing, and controlling the quality of water until acceptance and turn over by general contractor and owner.

9. Final cleaning, vacuuming of pool water and pool area at the direction of the general contractor.

10. Obtain approvals and permits and coordinate inspections and testing with governing local and state agencies.

11. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

12. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

13. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

14. Contractor must provide additional crews as needed to maintain the project schedule.

15. Provide pricing for all alternates as described in Section 012300-Alternates.

16. Provide a $10,000 allowance to be used at the discretion of the Construction Manager.

CONTRACT NO. A-22 - FIRE PROTECTION

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Division 3	Concrete
Section 078400	Firestopping
Section 079200	Joint Sealers
Section 21 05 00	Common Work Results For Fire Suppression
Section 21 05 53	Identification For Fire Suppression Piping And Equipment
Section 21 07 19	Fire Suppression Piping Insulation
Section 21 31 00	Fire Suppression Sprinklers
Division 28	Electronic Safety and Security
Division 31	Earthwork

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide piping, fittings, couplings, valves and sprinkler heads.

2. All pipe and equipment supports are to be tied to the building steel structure. No drilling into floor slabs or roof decking will be permitted.

3. Excavation and backfill related to fire protection work as detailed below is the responsibility of this Subcontractor. Soil types shall be in accordance with Del Dot standard specifications.

4. Before ANY excavation work is to commence, the Contractor/Excavator shall contact the utility companies or utility owners and advise them of the proposed work and ask them to mark the location of the underground utility installations. This notification shall be done within established or customary local response times. If the work is on private property and the utility company will not mark out the utilities, the Contractor/Excavator will hire a private locating service to mark the utilities. Once the utilities are located and marked, the Contractor/Excavator will excavate by hand or use a vacuum truck to expose the utilities and record the exact location and elevation of the utilities. The Contractor/Excavator must submit the Excavation Permit to EDiS Company verifying their assurance of communication with the utility companies or utility owners. The Contractor/Excavator must follow State, Local, and Federal Guidelines prior to proceeding with excavations. The Contractor/Excavator will have these marks restored as long as there is work to perform. Once the Contractor has installed new utilities, they will provide to EDiS Company an as-built drawing, within 7 days, showing the exact location and elevation of the utilities. The installing Contractor will be responsible for locating and marking these utilities for other contractors that may have work in the same area.

Provide As-built drawings. Maintain an updated red-lined set on-site, available to EDiS upon request.
5.

6. Provide Concrete equipment pads, curbs and thrust blocks for fire protection work.

7. Testing and inspections.

8. Cutting and patching.

9. Provide fire stopping.

10. Provide Design.

11. Flow and tamper switches to be supplied by this Subcontractor and wired by the Electrical Subcontractor. It is this contractor's responsibility to provide flow and tamper switches to meet applicable State and local codes.

12. Provide Fire pump, controller and related work. Wiring of pump and controller to be by the Electrical Subcontractor.

13. Provide preaction suppression system, controller, jockey pumps, flow meter and related work. Wiring of pump and controller to be by the Electrical Contractor.

14. Provide Meter, if required, and all applicable fees.

15. Provide backflow preventor as part of new incoming fire service.

16. Provide Pipe identification.

17. Sitework contractor will extend fire main from +/- 5 feet outside building to 1' above finish slab. Fire protection contractor is to make connection to fire main inside of the building.

18. The Concrete Contractor shall furnish, install and maintain stone fill under slab. The Sitework Contractor shall leave the building pad site at subgrade to within acceptable tolerances in preparation to receive stone fill. The Mechanical, Plumbing, Fire Protection, and Electrical Contractors shall complete their work under the slab on grade and shall be responsible to return the pad to the subgrade elevation left by the Sitework Contractor. The Concrete Contractor shall then adjust the select material to final subgrade, fine grade the slab and place the vapor barrier and stone fill.

19. Roof curbs, pipe, hoods and vent equipment & supports are to be supplied by contractor in which the units, piping, etc. are being supplied. The openings for the curbs in the roofing materials shall be cut by the Roofing Contractor. Openings in the metal deck shall be cut by the contractor in which the units are being provided. The roofing contractor shall provide all flashing and sealing of the curbs. Any wood blocking required will be provided by Carpentry & General Works Contractor.

20. This Subcontractor to coordinate the need for and compatibility of his system to the emergency generator, supplied by others.

21. Provide the necessary coordination with trade to avoid interferences with other work and make corrections at no extra charge.

22. Contractor must provide additional crews as needed to maintain the project schedule.

23. In addition to the insurance specified in Section 006216, this contractor will provide Pollution Insurance, with limits of $2,000,000 per occurrence and $2,000,000 aggregate.

24. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

25. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

26. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

27. Provide BIM services as detailed in spec section 013700 BIM Execution Plan.

28. BIM Coordination : This contractor will include $700 in their bid proposal to pay for the licensing agreement with Revizto for BIM Coordination of all trades.

29. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 90 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages

30. Provide a $10,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-23 - PLUMBING

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification Sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Division 3	Concrete
Section 078400	Firestopping
Section 079200	Joint Sealers
Section 083100	Access Doors and Panels
Division 22	Plumbing
Division 23	Heating, Ventilating and Air Conditioning
Division 26	Electrical
Division 31	Earthwork

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide a complete plumbing system, including but not limited to: domestic hot and cold water, hot water recirc, condensate piping, drain, waste, and vents, complete as indicated on the Drawings and in the Specifications. Include HVAC condensate piping as shown on Mechanical piping plans.

2. Provide the complete grease interceptor system and associated piping. Include deadman concrete blocks.

3. Provide the following piping systems for the pool:
    i. perimeter “Deck Drain” piping system (as noted on “AP” drawings) and connection to building sanitary drainage system.
    ii. “Suction” and “Return” perimeter piping loops. Include flanged fittings where pipe branches will extend to pool for connection by the pool contractor.
    iii. All piping by this contractor will extend into the pool equipment room/filter room, and stub 12”above finished floor elevation.

4. All pipe and equipment supports are to be tied to the building steel structure. No drilling into roof decking will be permitted.

5. Provide all domestic roof hydrants.

6. Provide all floor drains, floor sinks, and cleanouts. Include protection until completion of finished flooring.

7. Excavation and backfill for underground plumbing work as detailed below is the responsibility of this Contractor. Soil types shall be in accordance with Del Dot standard specifications. Refer to Division 31 and 33 of the specifications.

8. Backfilling of all scope within this contract is the responsibility of this Contractor. Soil types shall be in accordance with project documents.

9. Before ANY excavation work is to commence, the Contractor/Excavator shall contact the utility companies or utility owners and advise them of the proposed work and ask them to mark the location of the underground utility installations. This notification shall be done within established or customary local response times. If the work is on private property and the utility company will not mark out the utilities, the Contractor/Excavator will hire a private locating service to mark the utilities. Once the utilities are located and marked, the Contractor/Excavator will excavate by hand or use a vacuum truck to expose the utilities and record the exact location and elevation of the utilities. The Contractor/Excavator must submit the Excavation Permit to EDiS Company verifying their assurance of communication with the utility companies or utility owners. The Contractor/Excavator must follow State, Local, and Federal Guidelines prior to proceeding with excavations. The Contractor/Excavator will have these marks restored as long as there is work to perform. Once the Contractor has installed new utilities, they will provide to EDiS Company an as-built drawing, within 7 days, showing the exact location and elevation of the utilities. The installing Contractor will be responsible for locating and marking these utilities for other contractors that may have work in the same area.

10. Provide all Equipment bases and housekeeping pads related to plumbing equipment.

11. Permits/meters.

12. Permits and inspections. Costs for the permits are the responsibility of this contractor. Applying, corresponding, and receiving the permits is to be performed by this subcontractor. Costs for a meter (if required) and inspections are to be paid for by this subcontractor.

13. Provide Pipe and equipment insulation and labeling.

14. Penetrations through wall, floors, etc. including cutting, patching and fire stopping.

15. Provide all caulking and sealants for proper installation of plumbing equipment.

16. Coordinate with the Testing and balancing Contractor.

17. Provide daily Clean up.

18. All guarantees and warranties to begin at the substantial completion of the entire project. Maintain equipment prior to substantial completion.

19. Hoisting, rigging and scaffolding. Scaffolding to access the ceiling above the auditorium will be provided by the metal studs and drywall contractor and available to this contractor for use.

20. Coordination with Building Management Systems Contractor.

21. Provide Roof drains, all associated primary and secondary piping, and accessories.

22. Provide Natural Gas Piping work associated with the emergency generator.

23. Provide Gas piping, meter and pressure regulator valves.

24. Provide plumbing fixtures.

25. Sitework contractor will extend domestic and fire mains from +/- 5 feet outside building to 1' above finish slab. Plumbing contractor is to make connection to domestic main inside of the building.

26. The Concrete Contractor shall furnish, install and maintain stone fill under slab. The Sitework Contractor shall leave the building pad site at subgrade to within acceptable tolerances in preparation to receive stone fill. The Mechanical, Plumbing, Fire Protection, and Electrical Contractors shall complete their work under the slab on grade and shall be responsible to return the pad to the subgrade elevation left by the Sitework Contractor. The Concrete Contractor shall then adjust the select material to final subgrade, fine grade the slab and place the vapor barrier and stone fill. Concrete foundations will be installed prior to the start of the underground plumbing installation; plumbing contractor is responsible for excavation for installation of their pipes around concrete foundations and preventing cave-ins during installation of their underground piping. The plumbing contractor is to adjust underground plumbing locations based upon actual locations of concrete foundations.

27. Install Owner prepurchased equipment, if applicable.

28. Furnish Access panels where required to access plumbing. Installation of access panels to be provided by metal studs & drywall contractor.

29. Provide final tie-ins for residential and commercial appliances being supplied by the owner.

30. Provide flushing, cleaning, and sterilization of pipe as specified.

31. Provide As-built drawings. Maintain an updated red-lined set on-site, available to EDiS upon request.

32. Contractor must provide additional crews as needed to maintain the project schedule.

33. In addition to the insurance specified in Section 006216, this contractor will provide Pollution

Insurance, with limits of $2,000,000 per occurrence and $2,000,000 aggregate.

34. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

35. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. CSD and EDiS will not be responsible for any lost tools, materials or equipment.

36. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

37. Provide BIM services as detailed in spec section 013700 BIM Execution Plan.

38. BIM Coordination : This contractor will include $700 in their bid proposal to pay for the licensing agreement with Revizto for BIM Coordination of all trades.

39. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 90 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

40. Provide a $25,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-24 - MECHANICAL

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification Sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Division 3	Concrete
Section 078400	Firestopping
Section 079200	Joint Sealers
Section 083100	Access Doors and Panels
Division 22	Plumbing
Division 23	HVAC
Division 26	Electrical
Division 31	Earthwork

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide a complete mechanical and piping system as indicated on the Drawings and in the Specifications. Condensate piping and natural gas piping is to be provided by Contract B-58 : Plumbing.

   Provide all mechanical equipment and associated curbs.
2. All pipe and equipment supports are to be tied to the building steel structure. No drilling into roof decking will be permitted.

3. Division 26 of the specifications should be reviewed as it relates to the power wiring and other requirements for HVAC equipment including the coordination of furnishing and installing motor starters as provided in the specifications.

4. This Contractor shall be responsible to designate an individual within his organization, intimately familiar with this project and assigned on site, to act as the System Start-up Coordinator. This individual must be pre-approved by the Construction Manager. This individual's responsibilities shall include, but not be limited to, coordinating the start-up of all mechanical equipment, including the coordination between the Electrical Contractor, the Controls Contractor, and all testing, adjusting and balancing work. This individual shall report on a weekly basis, in written form, to the Construction Manager. These reports shall include a summary of current conditions including manufacturers' start-ups, systems' deficiencies noted to date and the remediation of same, coordination issues between trades, system interfacing and forecasting, as necessary to project the completion of each individual system within the building.

5. Excavation and backfill for underground mechanical work as detailed below is the

responsibility of this Contractor. Soil types shall be in accordance with Del Dot standard specifications. Refer to Division 31 and 33 of the specifications.

6. Backfilling is the responsibility of this Contractor. Soil types shall be in accordance with project documents.

7. Before ANY excavation work is to commence, the Contractor/Excavator shall contact the utility companies or utility owners and advise them of the proposed work and ask them to mark the location of the underground utility installations. This notification shall be done within established or customary local response times. If the work is on private property and the utility company will not mark out the utilities, the Contractor/Excavator will hire a private locating service to mark the utilities. Once the utilities are located and marked, the Contractor/Excavator will excavate by hand or use a vacuum truck to expose the utilities and record the exact location and elevation of the utilities. The Contractor/Excavator must submit the Excavation Permit to EDiS Company verifying their assurance of communication with the utility companies or utility owners. The Contractor/Excavator must follow State, Local, and Federal Guidelines prior to proceeding with excavations. The Contractor/Excavator will have these marks restored as long as there is work to perform. Once the Contractor has installed new utilities, they will provide to EDiS Company an as-built drawing, within 7 days, showing the exact location and elevation of the utilities. The installing Contractor will be responsible for locating and marking these utilities for other contractors that may have work in the same area.

8. Provide all Equipment bases and housekeeping pads related to HVAC equipment.

9. Supply all VFD's (not integral to equipment) to electrical contractor for installation.

10. Permits and inspections. Costs for the permits are the responsibility of this contractor. Applying, corresponding, and receiving the permits is to be performed by this subcontractor. Costs for a meter (if required) and inspections are to be paid for by this subcontractor.

11. Provide field layout of all wall penetrations to facilitate framing wall openings by masonry and carpentry subcontractors. This must be performed following wall layout by the masonry and carpentry subcontractors.

12. Provide Pipe and duct insulation.

13. Provide all tagging and labels.

14. Provide Penetrations through wall, floors, etc. including cutting, patching and fire stopping.

15. Provide all caulking and sealants for proper installation of mechanical equipment.

16. Coordinate with the Testing and balancing Contractor.

17. Daily Clean up.

18. All guarantees and warranties to begin at the substantial completion of the entire project. Maintain equipment prior to substantial completion. Mechanical equipment is to be utilized for building conditioning following completion of drywall installation and finishing to maintain operating building conditions during finish installation. This contractor is to provide gap warranties to extend the equipment warranty through this period in addition to the warranty period required by the specifications.

19. Hoisting, rigging and scaffolding. Scaffolding to access the ceiling above the auditorium will be provided by the metal studs and drywall contractor and available to this contractor for use.

20. Coordination with Building Management Systems Contractor.

21. Provide final tie-ins for residential and commercial appliances being supplied by the owner.

22. Provide Ductwork, flex duct, grilles and diffusers. Duct detectors are to be furnished by the Special Systems contractor and installed by this contract.

23. Provide all louvers and vents related to HVAC operations. Coordinate louver size, location and type of louver with architectural drawings.

24. The Concrete Contractor shall furnish, install and maintain stone fill under slab. The Sitework Contractor shall leave the building pad site at subgrade to within acceptable tolerances in preparation to receive stone fill. The Mechanical, Plumbing, Fire Protection, and Electrical Contractors shall complete their work under the slab on grade and shall be responsible to return the pad to the subgrade elevation left by the Sitework Contractor. The Concrete Contractor shall then adjust the select material to final subgrade, fine grade the slab and place the vapor barrier and stone fill.

25. Provide temporary heat and ventilation design, installation, maintenance and removal. Refer to Division 1, Specification Section 015123 - TEMPORARY HEATING, COOLING, & VENTILATION, for specific scope.This contractor will furnish, install, and maintain the temporary heating equipment. Temporary heating equipment will be provided under base bid. Temporary heating fuel consumption associated with the temporary heating will be charged against the allocation below. All unused portions of the allocation will be returned at the end of the project.

26. Roof curbs, pipe, hoods and vent equipment & supports are to be supplied by contractor in which the units, piping, etc. are being supplied. The openings for the curbs in the roofing materials shall be cut by the Roofing Contractor. Openings in the metal deck shall be cut by the contractor in which the units are being provided. The roofing contractor shall provide all flashing and sealing of the curbs. Any wood blocking required will be provided by Carpentry & General Works Contractor.

27. Install Owner prepurchased equipment, if applicable.

Furnish Access panels where required to access mechanical equipment. Installation of access panels to be provided by metal studs & drywall contractor.

28. This contractor to perform multiple duct leakage tests as coordinated with EDiS to align with schedule. Testing will not wait for complete installation of all duct.
29. Provide As-built drawings. Maintain an updated red-lined set on-site, available to EDiS upon request.

30. Contractor must provide additional crews as needed to maintain the project schedule.

31. In addition to the insurance specified in Section 006216, this contractor will provide Pollution Insurance, with limits of $2,000,000 per occurrence and $2,000,000 aggregate.

32. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

33. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. CSD and EDiS will not be responsible for any lost tools, materials or equipment.

34. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

35. Provide BIM services as detailed in spec section 013700 BIM Execution Plan.

36. BIM Coordination : This contractor will include $700 in their bid proposal to pay for the licensing agreement with Revizto for BIM Coordination of all trades.

37. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 90 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

38. Provide a $35,000 allocation to be used at the discretion of the Construction Manager.

39. Provide a $50,000 allocation for fuel for temporary heating systems.

CONTRACT NO. A-25 – BUILDING MANAGEMENT SYSTEMS

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 033000	Cast-in-Place Concrete
Section 078400	Firestopping
Section 083100	Access Doors and Panels
Division 21	Fire Suppression
Division 22	Plumbing
Division 23	Mechanical
Section 230913	Instrumentation and Controls Devices for HVAC
Section 230923	Direct-Digital Control Systems for HVAC
Section 230993	Sequence of Portions for HVAC Controls
Division 26	Electrical
Section 312000	Earth Moving
Section 312319	Dewatering

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Automatic Temperature Controls for equipment whose main purpose include all items in the Automatic Temperature Control Scope. Provided, however, that the controls do not directly switch the power lines to the equipment; the wiring of such controls to remain the responsibility under the electrical contract.

2. Provide conduits, boxes and pull strings for equipment, controls, devices and wiring associated with the work in this contract.

3. Provide Environmental controls.

4. Provide Ventilation controls.

5. Provide Cooling controls.

6. Provide Humidification controls.

7. Provide HVAC Refrigeration controls.

8. Motorized dampers when not specified as part of factory packaged equipment supplied to job site for distribution and installation by others.

9. Provide both reading and remote gauges, transmitters and recorders for automatic temperature controls.

10. Provide building centralization controls including but not limited to centralized temperature, humidity, pressure and flow indication and recorders, centralization of air conditioning, heating, ventilation, humidification and refrigeration equipment operation. Provide integration of all equipment as required by the Construction Documents.

11. Provide building life safety control and equipment safety control including: fire alarm, fan shut downs, operators and controls for motorized smoke dampers, operators and controls for motorized fire dampers, firestats, freeze protection thermostats, shut down safety devices forming part of automatic temperature control.

12. Permit as required for work under this subcontract scope.

13. Provide Inspections as required under this subcontract scope.

14. Provide Electrical thermostats intended for automatic temperature controls complete with subbases or adapter plates to mount on standard electrical box.

15. Remote reading gauges, transmitters and recorders for automatic temperature control.

16. Supply access doors and frames for all access to Building Management System components or equipment that require routine or periodic maintenance. Installation of access doors and frames provided by the Metal Stud & Drywall Contractor.

17. Provide control wiring and/or air piping required for all automatic temperature controls supplied under the subcontract scope.

18. Provide wiring for remote thermostats and remote prewired auxiliary control panels for packaged equipment.

19. Provide magnetic starter coil and relay coils intended for automatic temperature controls, including interlocking between starters and/or relays when controlled automatically.

20. Exclude direct reading temperature and pressure gauges connected directly to non-potable water systems.

21. Exclude motorized dampers when specified as integral part of packaged equipment.

22. Exclude automatic temperature controls when specified as integral part of packaged equipment.

23. Exclude flow measuring and control devices.

24. Exclude direct reading temperature and pressure gauges connected directly to refrigeration systems.

25. Exclude filter gauges directly connected to duct systems.

26. Electrical wiring for thermostats and controls which directly switch the power line to the equipment (directly shall mean not through magnetic coil) is by the Electrical Contractor.

27. Power wiring is by the Electrical Contractor.

28. Control power supply outlets are by the Electrical Contractor.

29. Exclude fire alarm, fan shut-down, relays and wiring by Section 28 07 21.

30. Provide transmitters for ATC.

31. Start, test and demonstrate all equipment installed under this category of work. Provide proposed schedule, including names and telephone numbers of attending representatives at least (3) three weeks in advance of demonstration.

32. Submissions will be reviewed once and any resubmittals will be reviewed once. Any other submittals will be billed to the contractor at the Engineers standard rates. Please thoroughly review all submissions prior to forwarding to avoid these costs.

33. Contractor must provide additional crews as needed to maintain the project schedule.

34. In addition to the insurance specified in Section 006216, this contractor will provide Pollution Insurance, with limits of $2,000,000 per occurrence and $2,000,000 aggregate.

35. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

36. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. CSD and EDiS will not be responsible for any lost tools, materials or equipment.

37. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

38. Provide BIM services as detailed in spec section 013700 BIM Execution Plan.

39. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 90 days following submission of a bid

proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

40. Provide a $5,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-26 – ELECTRICAL

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 033000	Cast-In-Place Concrete
Section 078400	Firestopping
Section 079200	Joint Sealants
Section 083100	Access Doors and Panels
Section 087100	Door Hardware
Section 210533	Heat Tracing for Fire Suppression Piping
Division 21	Fire Suppression
Division 23	Mechanical/HVAC
Division 26	Electrical
Division 27	Communications
Division 28	Electrical Safety and Security
Section 337119	ELEC Underground Ducts, Ductbanks, and Manholes

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide a complete electrical system as indicated on the drawings, schedules and in the specifications.

2. Divisions 22 and 23 of the specifications should be reviewed as it relates to the power wiring and other requirements for Plumbing and HVAC equipment including the coordination of furnishing and installing motor starters and controllers as detailed in the Specifications and on the Drawings.

3. Excavation and backfill for underground electrical work as required below is the responsibility of this Subcontractor. Soil types shall be in accordance with Del Dot standard specifications.

4. Before ANY excavation work is to commence, the Contractor/Excavator shall contact the utility companies or utility owners and advise them of the proposed work and ask them to mark the location of the underground utility installations. This notification shall be done within established or customary local response times. If the work is on private property and the utility company will not mark out the utilities, the Contractor/Excavator will hire a private locating service to mark the utilities. Once the utilities are located and marked, the Contractor/Excavator will excavate by hand or use a vacuum truck to expose the utilities and record the exact location and elevation of the utilities. The Contractor/Excavator must submit the Excavation Permit to EDiS Company verifying their assurance of communication with the utility companies or utility

owners. The Contractor/Excavator must follow State, Local, and Federal Guidelines prior to proceeding with excavations. The Contractor/Excavator will have these marks restored as long as there is work to perform. Once the Contractor has installed new utilities, they will provide to EDiS Company an as-built drawing, within 7 days, showing the exact location and elevation of the utilities. The installing Contractor will be responsible for locating and marking these utilities for other contractors that may have work in the same area.

5. Utilize directional drilling methods where indicated on project documents.

6. Provide temporary power connections (and removal) to temporary heat installations by others. Assume (4) different points of connection, providing 240V/30A to each.

7. This contractor shall provide temporary transformers as required to provide electrical power generation until permanent service is installed by Delmarva power. Include all permits, cabling, switch gear, panels, breakers etc.to provide a complete temporary power system capable of supplying the electrical loads required for the project. This contractor to coordinate and arrange for temporary power from the source, Delmarva Power. Include boring across route 7 to provide temporary power feeds from existing power lines and additional 2" conduit for data by service provider.

8. Provide temporary power for meter bank with transformer including **(10)** individual electric meters with disconnects for contractors trailers. Provide (2) to EDiS trailer located within east lot, remainder to be located within the north contractors lot. Coordinate all work with Delmara Power.

9. Power Centers (waterproof) for miscellaneous tools and equipment used in the construction work shall be provided with a minimum of four 20-amp, 120 volt grounding type outlets. Each outlet shall be provided with ground fault detecting circuit breaker protection. The distance between each receptacle location shall not exceed 50 feet.

10. Construction areas, ramps, runways, corridors, offices, shops, and storage areas shall be lighted to not less than the minimum illumination intensities at five (5) foot candles and any additional OSHA Temporary lighting and receptacles exposed to wet or damp locations must be weatherproof. Adequate lighting for safe working conditions and the exterior of the structure shall be provided and maintained on a 24 hour per day basis throughout the building. Voltage of each lighting component must be able to accommodate lighting requirements.

11. Provide Temporary electric and lighting installation, maintenance and removal. Refer to Division 1, specification section 015113 - TEMPORARY ELECTRIC, for specific scope. Provide temporary exterior lighting per specification section 015113 - TEMPORARY ELECTRIC.

12. Include all primary service work, including all utility company related costs/fees for this work and all underground conduit for primary electric service and voice/data service. Include all primary cabling feeding the school from the street service to on-site transformer. Primary voice/data cabling to terminate within the MDF closet per site plan drawings.

13. Provide concrete for duct banks, light standards, above ground conduit encasement, equipment bases and any other concrete work specifically related to the electrical work. Include requirements of the State and local codes for concrete encasement.

14. Provide underground conduit/cabling/wiring to all locations within courtyards.

15. Provide site electric feeding all exterior lighting connected to the building. Provide all underground conduit to site lighting fixtures for data and low voltage cabling for security and communications.

16. Receive, install, and power all VFD's supplied by the mechanical contractor.

17. Provide electric vehicle charging stations.

18. Provide rough in and final connection and related work for equipment provided under other contracts (i.e. elevators, HVAC, sprinkler, motorized doors, etc.)

19. Provide conduits, raceways, and pull strings for low-voltage wiring at doors receiving electronic or security hardware, including associated electronic card readers. Low voltage wiring from the controller to hardware shall be provided by the installing doors and frames contractors. Electrical contractor to install power supply and make final power connections. Final connections of low-voltage wiring to hardware to be provided by special systems contractor. Magnetic Door Hold-Opens are to be furnished by the Doors, Frames, Hardware contractor to this Contract for installation including power. The special systems contractor will make final connections for the relay to the fire alarm.

20. Provide power circuits to all systems installed by the Special Systems Contractor including, but not necessarily limited to the following: Wireless Clock System, Intercom/Public Address System, Fire Alarm System, Sound Reinforcement Systems, Access Control System, CCTV System.

21. Provide power circuits for electrified hold open hardware. Hold open hardware will be supplied by Doors, Frames, and Hardware Contractor, installed by this contractor. Fire alarm wiring, terminations, and programming by Special Systems Contractor. Special Systems Contractor shall provide low-voltage power to door hold open hardware.

22. Provide conduit, pull strings, and boxes to above accessible ceilings with pull strings for complete audio and audiovisual systems.

23. Provide all heat tracing.

24. Provide bonding of all pool equipment per "AP" drawing notes.

25. Provide grounding of equipment, racks, building columns and interior spaces as required.

26. Provide all electric baseboard heaters, unit heaters, cabinet unit heaters. Include all disconnects,

relays, sensors.

27. Provide boxes, pathways, and pull strings to above accessible ceilings for low voltage cables provided by the Special Services and Structure Cable Contractors.

28. Provide Pull strings, Conduit, and boxes for voice/data boxes to above accessible ceilings.

29. Provide all Equipment bases and housekeeping pads related to Electrical equipment.

30. Include generator and transformer pads.

31. Provide final tie-ins for residential and commercial appliances.

32. The Concrete Contractor shall furnish, install and maintain stone fill under slab. The Sitework Contractor shall leave the building pad site at subgrade to within acceptable tolerances in preparation to receive stone fill. The Mechanical and Electrical Contractors shall complete their work under the slab on grade and shall be responsible to return the pad to the subgrade elevation left by the Sitework Contractor. The Concrete Contractor shall then adjust the select material to final subgrade, fine grade the slab and place the vapor barrier and stone fill.

33. Provide proper coordination with Painting Contractor to ensure that exposed boxes, raceways, and conduit are painted simultaneous to adjacent construction. Any costs that arise from out of sequence painting of exposed boxes, raceways, and conduits will be the responsibility of this Contractor. Provide conduit and boxes for all systems (electric, low-voltage, A/V, network cabling, fire alarm, security, etc) in open ceiling areas.

34. Provide and coordinate permits, testing, and inspections.

35. Provide penetrations through walls, floors, etc. including cutting, patching and fire safing.

36. Testing.

37. Clean up.

38. Provide hoisting, rigging and scaffolding.

39. Provide fully coordinated shop drawings with MEP Trades within 8 weeks from award of project.

40. Submissions will be reviewed once and any resubmittals will be reviewed once. Any other submittals will be billed to the contractor at the Engineers standard rates. Please thoroughly review all submissions prior to forwarding to avoid these costs.

41. All guarantees and warranties to begin at the substantial completion of the entire project. Maintain equipment prior to substantial completion.

41. Provide As-built drawings. Maintain an updated red-lined set on-site, available to EDiS upon request.
42.

43. Contractor must provide additional crews as needed to maintain the project schedule.

41. In addition to the insurance specified in Section 006216, this contractor will provide Pollution Insurance, with limits of $2,000,000 per occurrence and $2,000,000 aggregate.

42. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

43. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. CSD and EDiS will not be responsible for any lost tools, materials or equipment.

44. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

45. Provide BIM services as detailed in spec section 013700 BIM Execution Plan.

46. BIM Coordination : This contractor will include $700 in their bid proposal to pay for the licensing agreement with Revizto for BIM Coordination of all trades.

47. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 90 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

48. Provide a $35,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-27 : SPECIAL SYSTEMS

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification Sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 078400	Firestopping
Section 079200	Joint Sealants
Section 083113	Access Doors and Frames
Section 087100	Door Hardware
Section 114000	Food Service Equipment
Section 210505	Fire Suppression System Piping, Fittings & Valves
Section 211000	Water Based Fire Suppression System – Fire Pump
Section 211003	Water Based Fire Suppression System - Sprinklers
Section 270500	Telecommunications Pathways and Spaces
Section 271005	Structured Cabling for Voice and Data – Inside-Plant
Section 275117	Public Address Systems
Section 275313	Wireless Clock System
Section 281500	Integrated Access Control Hardware Devices
Section 283100	Fire Detection and Alarm

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide intercom/public address system. Structured Cable Contractor will provide all network cabling including wiring, devices, and terminations at the source (MDF/IDF patch panel) and at the communication port (jack).

2. Provide complete fire alarm system is to be provided by this contractor including all equipment, cable, and accessories. Water flow devices are supplied and installed by the Fire Protection Contractor and wired by this Contractor. Include tie-in to fire sprinkler flow and tamper switch. Fire alarm wiring, terminations, and programming of electrified hold open hardware by Special Systems Contractor. Low voltage power to electrified hold open hardware by Special Systems Contractor. Hold open hardware provided by Carpentry and General Work Contractor.

3. Provide complete intrusion system.

4. Provide access control and security management system. This Contractor to expand the existing district access system to cover this entire building as indicated. Provide coordination with door and frame installation for a complete system. The contractor responsible for supplying the doors, frames, and hardware shall provide all wiring and accessories from the power supply (or junction box) to the door hardware. The contractor responsible for installation of doors and hardware shall provide terminations from door hardware to door whip, from door whip to power transfer, and from frame whip to power transfer. Frame whip shall be secured and protected by the door, frame, and hardware contractor(s) for the direct access of the Special Systems Contractor. Termination of the frame whip to the power supply (or junction box) shall be provided by the Special Systems Contractor. Power supply shall be furnished by the door, frame, and hardware contractor(s) and installed by the Special Systems Contractor. The Special Systems Contractor shall provide low-voltage wire from the card reader to the access controller, from the status switch (door contact) to the access controller, from access controller to the power supply(or junction box), and from power supply (or junction box) to power supply (or junction box) as necessary. The Electrical Contractor is responsible for providing 120v circuits to all power supplies and/or transformers as indicated in the documents. The Electrical Contractor shall provide conduits, device boxes, raceways, and pull strings for low-voltage wiring at doors receiving electronic, security, or access control hardware. Electrical contractor shall provide a junction box above each door scheduled to receive a card reader and a pathway & pull string. A mock-up shall be field installed and coordinated by all related Contractors for review prior to commencing work.

5. Provide a complete CCTV - Network Digital Video Management System. Owner shall provide server.

6. Provide all patch cords from communication port (jack) to each device included in this Contractor's scope. Patch cords at source (MDF/IDF) from patch panel to network switch provided by owner.

7. Provide coordination of the work of this contract with the Electrical and Structured Cable Contractor, including final equipment locations. This contractor must coordinate with Electrical Contractor as indicated on the drawings and as specified. The Electrical Contractor shall provide all device boxes, conduit and pull strings to circuits for special systems as indicated and also to provide 120 Volt circuits for all Special Systems. This Contractor will be responsible for providing independent support systems, as indicated in the specifications, for all cable and wiring installed by this Contractor in locations where pathways and raceways are not required by the documents.

8. Interactive screens/displays and mounting brackets will be supplied by Owner and mounted by the Carpentry & General Works Contractor. The Carpentry and General Works Contractor will coordinate blocking with mounting hardware and install all necessary clips and blocking to the wall for hanging. Audio/visual interface and/or controls by Special Systems Contractor.

9. Hardware for permanent exterior gates will be provided by the Sitework Contractor. Access control hardware/software and fire alarm integrations of gate hardware, including terminations, cabling, etc. will be provided by the Special Systems Contractor. The Electrical Contractors shall provide all pathways & electrical requirements to support installation.

10. Provide access doors and frames for all access to Special Systems components or equipment that require routine or periodic maintenance. Installation of access doors and frames provided by the Metal Stud & Drywall Contractor.

11. Provide penetrations through walls, floors, etc., including cutting, patching and fire safing.

12. Provide testing for 800 MHZ emergency radio system and provide report for submission to building code officials.

13. Furnish and deliver all duct detectors.

14. Provide all design and coordination necessary to provide complete systems.

15. Provide and coordinate for inspections and testing.

16. Provide fire resistive sealants for the work of this contract.

17. Provide pricing for all alternates as described in Section 012300-Alternates.

18. Submissions will be reviewed once and any resubmittals will be reviewed once. Any other submittals will be billed to the contractor at the Engineers standard rates. Please thoroughly review all submissions prior to forwarding to avoid these costs.

19. Provide video documentation of training on systems.

20. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

21. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

22. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be incorporated into the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

23. Contractor must provide additional crews as needed to maintain the project schedule.

24. Provide pricing for all alternates as described in Section 012300-Alternates.

25. Provide a $10,000 allocation to be used at the discretion of the Construction Manager.

CONTRACT NO. A-28: STRUCTURED CABLE

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification Sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 078400	Firestopping
Section 079200	Joint Sealants
Section 083100	Access Doors and Frames
Section 087100	Door Hardware
Section 114000	Foodservice Equipment
Section 211300	Fire Suppression Sprinklers
Section 271005	Structure Cabling For Voice And Data – Inside-Plant
Section 281500	Integrated Access Control Hardware Devices

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide all network cabling including wiring, devices, and terminations to communication devices identified in plans and referenced on "Communications Outlet Configuration". Two (2) terminations should be provided (1) at the source (MDF/IDF patch panel) and (1) at the communication port (jack) in all instances.

2. Provide all network cabling including wiring, devices, and terminations for devices provided by the Special Systems Contractor, specifically to devices identified in plans and referenced on "Communications Outlet Configuration" chart. Two (2) terminations should be provided (1) at the source (MDF/IDF patch panel) and (1) at the communication port (jack) in all instances. Structured Cable Contractor will provide cable installation for the following Special Systems Contractor installed systems:
   a. Telephone system and voicemail system.
   b. CCTV - Network Digital Video Management System.

3. The Structured Cable Contractor will provide ONLY network interface (data drops) installation for the following Special Systems Contractor installed systems:
   a. Fire alarm system
   b. Intercom/public address system
   c. Intrusion system
   d. Access Control

4. Structured Cable Contractor will install communication wiring from the access control panels to the source (MDF/IDF patch panel) including terminations on both ends. Location of access control panels to be coordinated with the documents, the Special Systems Contractor and the

Construction Manager prior to installation.

5. Structured Cable Contractor will install communication wiring from the intrusion control headend to the source (MDF/IDF patch panel) including terminations on both ends. This communication wiring shall include (1) dedicated POTS line from the MDF room to the intrusion control dialer. Location of intrusion control headend to be coordinated with the documents, the Special Systems Contractor and the Construction Manager prior to installation.

6. Structured Cable Contractor will install communication wiring from the Fire Alarm Control Panel (FACP) to the source (MDF/IDF patch panel) including terminations on both ends. This communication wiring shall include (2) dedicated POTS line from the MDF room to the FACP dialer(s). Location of FACP to be coordinated with the documents, the Special Systems Contractor and the Construction Manager prior to installation.

7. Structured Cable Contractor will install communication wiring from the intercom/public address amplifiers to the source (MDF/IDF patch panel) including terminations on both ends. Location of amplifiers to be coordinated with the documents, the Special Systems Contractor and the Construction Manager prior to installation. Contractor should assume one amplifier located in each MDF/IDF.

8. Structured Cable Contractor will install communication wiring from the Building Management System headend to the source (MDF/IDF patch panel). Location of Building Management System headend to be coordinated with the documents, the Mechanical Contractor, and the Construction Manager prior to installation.

9. Structured Cable Contractor will install all network cable within the kitchen and kitchen hood identified on the Kitchen Equipment Drawings. Final location of network drops to be coordinated with the documents, the Kitchen Equipment Contractor, and the Construction Manager prior to installation.

10. Structured Cable Contractor will install communication wiring from the food management systems to the POS devices, menu display boards, and temperature monitoring systems, including terminations on both ends. Final location of the food management systems to be coordinated with the documents and the Construction Manager prior to installation.

11. Provide all wireless access points. Patch cords from device to communication port (jack) provided by this Contractor.

12. Provide coordination of the work of this contract with the Electrical and Special Systems Contractor, including final equipment locations. This contractor must coordinate with Electrical Contractor as indicated on the drawings and as specified. The Electrical Contractor shall provide all device boxes, conduit and pull strings to circuits for special systems as indicated. This Contractor will be responsible for providing independent support systems, as indicated in the specifications, for all cable and wiring installed by this Contractor in locations where pathways and raceways are not required by the documents. This Contractor shall provide all additional boxes and conduits where required to make a complete system.

13. Perform certification testing of all cables and provide full close-out documentation.

14. Provide access doors and frames for all access to Structured Cable components or equipment that require routine or periodic maintenance. Installation of access doors and frames provided by the Metal Stud & Drywall Contractor.

15. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.

16. This is not a secure site. All contractors are responsible for concealing, locking and/or removing any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

17. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be incorporated into the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

18. Contractor must provide additional crews as needed to maintain the project schedule.

19. Provide pricing for all alternates as described in Section 012300-Alternates.

20. Provide a $5,000 allocation, included in base bid, to be used at the discretion of the Construction Manager.

CONTRACT NO. A-29 - TESTING & BALANCING

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials, and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 230593	Testing, Adjusting, and Balancing for HVAC

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide water and air testing and balancing.
2. Contractor shall prepare, at a minimum, a preliminary balance report for the building permit Final Inspection.
3. Submissions will be reviewed once and any resubmittals will be reviewed once. Any other submittals will be billed to the contractor at the Engineers standard rates. Please thoroughly review all submissions prior to forwarding to avoid these costs.
4. Provide complete signed and sealed testing report prior to substantial completion and final inspection as required by the building permit.
5. This contractor has been allotted 30 days to complete all work and provide final, sealed balancing report by the Construction Manager. This contractor will need to work closely with the Construction Manager and all MEP trades to sequence work so that the completion of the balancing is completed in a manner that does not delay acceptance from New Castle County or CSD.
6. Provide confirmation of duct testing completed by Mechanical Contractor.
7. This contractor must provide all lifts or scaffold means to access all elements
8. Provide circulating water system test.
9. Contractor must provide additional crews as needed to maintain the project schedule.
10. Provide at least a 48 hour notice prior to any delivery. All deliveries are to be between 7:00 AM and 3:30 PM.
11. This is not a secure site. All contractors are responsible for concealing, locking and/or removing

any materials on a daily basis. EDiS will not be responsible for any lost tools, materials or equipment.

12. This contractor must provide a silica exposure plan that meets or exceeds the new 2017 silica OSHA requirements before any work can commence. At a minimum, it must be implemented in to the company safety plan, include all monitoring, testing, limits exposure, provide respiratory plan and/or equipment modifications such as adding water to equipment during exposed work and keep records of exposure.

13. Provide pricing for all alternates as described in Section 012300-Alternates.
    a. Contractor is to guarantee all alternate pricing for 90 days following submission of a bid proposal. Decisions regarding alternate selection is to be made following receipt of all bid packages.

END OF SECTION

SECTION 012100 - ALLOWANCES

1. RELATED DOCUMENTS

   A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.

   B. Refer to provisions in AIA Document A232 – 2019 EDITION, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, CONSTRUCTION MANAGER AS ADVISOR EDITION, for requirements in addition to those specified in Division 1.

   C. Refer to Scope Information Sheets for all contracts bound in the Project Manual under Section 011100 - SUMMARY OF WORK. The Scope Information Sheets describe generally the work included in each contract, but the work is not necessarily limited to that described.

   D. For work being constructed under separate prime contracts, provisions of this Section apply to each contract being bid.

   E. Include in the Contract Sum all lump sum and unit cost allowances stated in the Contract Documents.

   F. Designate in the construction progress schedule the delivery dates for products specified under each allowance.

   G. Designate in the Schedule of Values the quantities of materials required under each unit cost allowance.

2. ALLOWANCES FOR PRODUCTS

   A. The amount of each allowance includes:

      1. The cost of the product or labor to the Contractor or Subcontractor, less any applicable trade discounts.

      2. Delivery to the site.

      3. Labor required under the allowance, only when labor in specified to be included in the allowance. If labor is not specified to be included in the allowance, it shall be included in the Contractor's bid and in the resulting Contract Sum.

      4. Applicable taxes.

      5. Profit and overhead.

   B. In addition to the amount of each allowance, include in the Contract Sum the Contractor's costs

for:

1. Handling at the site; including unloading, uncrating and storage.

2. Protection from the elements and from damage.

3. Labor for installation and finishing, except where labor is specified to be a part of the allowance.

4. Other expenses required to complete the installation.

5. Contractor's and Subcontractor's overhead and profit.

C. Refer to Scope Information Sheets under Section 011100 - SUMMARY OF WORK for the amount of each lump sum allowance and for work specified in the specification sections listed below.

3. ADJUSTMENT OF COSTS

A. Should the net cost be more or less than the specified amount of the allowance, the Contract Sum will be adjusted accordingly by Change Order.

1. For products and labor specified under a unit cost allowance, the unit cost shall apply to the quantities actually used with a nominal allowance for waste, as determined by receipted invoices, or by field measurement.

B. At Contract closeout, reflect all approved changes in Contract amounts in the final statement of accounting.

END OF SECTION

SECTION 012200 - UNIT PRICES

1. GENERAL PROVISIONS

   A. The general provision of the Contract, including the Conditions of the Contract (General, Supplementary and other conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.

   B. Refer to provisions in AIA Document A232 – 2019 EDITION, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, CONSTRUCTION MANAGER AS ADVISOR EDITION, for requirements in addition to those specified in Division 1.

   C. For work being constructed under separate prime contract, provisions of this Section apply to each contract being bid.

2. BASE BID

   A. The Base Bid shall consist of all work shown or specified in the Contract Documents, exclusive of any Additive Unit Prices specified herein.

   B. The Base Bid shall include all work in any Subtractive Unit Prices specified herein.

3. UNIT PRICES

   A. State in the Bid Form the amount to be added to (or subtracted from) the Base Bid per unit of measurement for each Unit Price specified. State this amount to include all overhead and profit. No surcharge in addition to the Unit Price listed will be permitted.

   B. See Section 002113, INSTRUCTIONS TO BIDDERS for related information.

   C. For description of Unit Prices requested, refer to the specification. The method of stating the Unit Prices is described in the Bid Form.

   D. Where both add and deduct unit prices are requested, there shall not be more that a 15% variation between the two.

4. APPLICATION OF UNIT PRICES

   A. Unit prices stated in the Bid Form will apply from the time the Bid is submitted until Contract completion.

5. MEASUREMENT OF QUANTITIES

   A. Quantities shall be determined by field measurement by contractor personnel and as verified by the Construction Manager.

B. At the Contractor's option, and at his expense, measurement may be made by a registered surveyor.

6. LIST AND DESCRIPTION OF UNIT PRICES

		BULK		TRENCH	
		Add	Deduct	Add	Deduct
1.	Price per Cubic Yard for earth excavation as specified In excavation section	_____c/y	_____c/y	_____c/y	_____c/y
2.	Price per cubic yard for earth excavation.	_____c/y	_____c/y	_____c/y	_____c/y
3.	Price per cubic yard for earth fill required to replace rock excavation, including finishing, placing and compacting.	_____s/y	_____s/y	_____s/y	_____s/y
4.	Price per cubic yard to supply & install Bio-Media Mix	_____c/y	_____c/y	_____c/y	_____c/y
5.	Price per cubic yard for excavation and backfill With select material	_____c/y	_____c/y	_____c/y	_____c/y
6.	Price per cubic yard to undercut subgrade and backfill with imported structural fill material. Spoils to be exported from site.	_____c/y	_____c/y	_____c/y	_____c/y
7.	Price per cubic yard to undercut subgrade and backfill with on-site mined structural fill. Spoils to be exported from site.	_____c/y	_____c/y	_____c/y	_____c/y
8.	Price per cubic yard to undercut footings subgrade and backfill with select spoils to be placed on site	_____c/y	_____c/y	_____c/y	_____c/y
9.	Price per cubic yard to undercut subgrade and backfill with 106A stone. Spoils to be exported from site.	_____c/y	_____c/y	_____c/y	_____c/y
10.	Price per cubic yard to load trucks provided by William Penn Sitework contractor above Quantity stated in Alternate 11.	_____c/y	_____c/y	_____c/y	_____c/y

END OF SECTION

SECTION 012300 - ALTERNATES

1. GENERAL PROVISIONS

   A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.

   B. Refer to provisions in AIA Document A232 – 2019 Edition, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, CONSTRUCTION MANAGER AS ADVISOR EDITION, for requirements in addition to those specified in Division 1.

   C. For work being constructed under separate prime contracts, provisions of this Section apply to each contract being bid.

2. BASE BID

   A. The Base Bid shall consist of all Work shown or specified in the Contract Documents, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids (if any are required to be stated in the bid).

   B. The Base Bid shall include all work in any Subtractive Alternates specified herein.

3. ALTERNATES

   A. State in the Bid Form, where applicable, the amount to be added to or deducted from the amount of the Base Bid for each Alternate specified.

   B. See Section 002113 - INSTRUCTIONS TO BIDDERS for related information.

   C. The description of Alternates contained herein is in summary form. Detailed requirements for materials and execution shall be as specified in other sections and as shown on drawings.

   Alternate No. 1: Provide Additional Walking Surfaces in the Rear Walking Path Area
      1. State in the Bid Form the amount to be modified to the Base Bid amount to provide additional walking paths as delineated on Sheet C-111A.
      2. Note that the Base Bid includes providing less area of walking paths in the rear area as delineated on Sheet C-111.

   Alternate No. 2: Provide EPDM Playing Surfaces and Concrete Basketball Court at Rear Walking Path Area
      1. State in the Bid Form the amount to be modified to the Base Bid amount to provide EPDM Playing Surfaces and Concrete Basketball Court at Rear Walking Path Area as shown on Sheet C-111A.
      2. Note that the Base Bid includes providing grass in between the walking path areas as shown on Sheet C-111.

Alternate No. 3: Provide Synthetic Play Surface in Courtyard #3

1. State in the Bid Form the amount to be modified to the Base Bid amount to provide "Synthetic Turf Play Surface" in Courtyard #3 as shown on Sheet C-111A.
2. Note that the Base Bid includes providing poured EPDM play surface as shown on Sheet C-111. Base bid and alternate should both include providing drainage as delineated on Sheet C-111.

Alternate No. 4: Eliminate east parking area.

1. State in the Bid Form the amount to be modified to the Base Bid amount to eliminate the west parking area (concrete curbs/island, asphalt paving, striping), extending the east grasses and concrete curb to border the "FIRE LANE". Storm drain piping and structures are to be installed as shown under both the base bid and alternate.
2. Note that the Base Bid includes providing the west parking lot including concrete curbs/island, asphalt paving, striping, Lighting.

Alternate No. 5: Provide Pergola in Courtyard #3

1. State in the Bid Form the amount to be modified to the Base Bid amount to provide the Pergola in Courtyard #3 as detailed.
2. Note that the Base Bid includes providing anchoring in the building wall and concrete foundations for the future installation of a pergola in this location.

Alternate No. 6: Face Brick Alternate Product

1. State in the Bid Form the amount to be modified to the Base Bid amount to provide Bowerston Santa Fe Smooth Modular bricks in lieu of the base bid selection.
2. Note that the Base Bid includes providing Belden Modular Commodore Full Smooth, 20-09 bricks.

Alternate No. 7: Modify Selected Interior Partitions from Masonry to Drywall

1. State in the Bid Form the amount to be modified to the Base Bid amount to replace selected interior masonry partitions to full height drywall partitions.
2. Note that the Base Bid includes providing masonry partitions as shown on the base bid documents.

Alternate No. 8: Reduce Drywall Soffits

1. State in the Bid Form the amount to be modified to the Base Bid amount to provide additional drywall soffits in the classrooms and corridors as shown on the reflected ceiling drawings.
2. Note that the Base Bid includes providing valances above the casework and continuing the acoustical ceiling to the walls and lighting as shown on the base bid drawings.

Alternate No. 9: Add Vocational Kitchen Equipment

1. State in the Bid Form the amount to be modified to the Base Bid amount to supply and install the vocational kitchen equipment shown in the Vocational Kitchen. Added costs are to include final tie-in to new equipment by the mechanical, electrical, and controls contractors.
2. Note that the Base Bid includes providing MEP rough-ins throughout the vocational kitchen space.

Alternate No. 10: Add Greenhouse in Courtyard #2

1. State in the Bid Form the amount to be modified to the Base Bid amount to supply and install the greenhouse as detailed on Sheet A-850. Masonry contractor is to provide masonry walls above grade. Plumbing, electrical, and mechanical contractors to include costs for final connections to Greenhouse Equipment.
2. Note that the Base Bid includes providing concrete footers, masonry foundations to grade (no rebar is to extend above grade, epoxy anchors will be utilized in the future), concrete slabs, and MEP rough-ins within the courtyard as detailed in the base bid drawings. Stone for the drainage trenches is to be provided by Contract A-03 : Concrete.

Alternate No. 11: Excess Soils Export

1. State in the Bid Form the amount to be modified to the Base Bid amount to export all excess soils to a location selected by the sitework contractor.
2. Note that the Base Bid includes the export of 20,000 cy of excess soils to the upcoming William Penn High School project. Contract A-01 : Sitework is to include loading trucks supplied by site contractor at the high school project only (no transport required by this Contract A-01). Any additional loading of soils beyond the 20,000 cy stated is to be handled on a unit cost basis. Contract A-01 : Sitework is to provide removal of all remaining excess soils from site.

END OF SECTION

SECTION 012600 - CHANGE ORDER PROCEDURES

1. GENERAL

A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.

B. Refer to provisions in AIA Document A232 – 2019 EDITION, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, CONSTRUCTION MANAGER AS ADVISOR EDITION, for requirements in addition to those specified in Division 1.

C. The Construction Manager is responsible for processing all change orders. Each request will be assigned a change order request (COR) number. The Change Order Request & Execution Form will be initiated via the web-based project management system (Building Blok) used by the CM.

D. It is to be clearly understood that no extra work shall commence without an approved written and executed change order from the Owner.

2. INITIATING A CHANGE ORDER

A. Specific changes initiated by the Owner, Architect, Construction Manager (CM) or Contractor will be processed as follows:

1. The Owner will authorize the Architect to prepare sufficient documents to establish an accurate price. These documents to be forwarded to the Construction Manager and Owner "for pricing only, not authorized for construction." The Construction Manager will develop the estimate (within 2 weeks) showing a breakdown by trades with all trade contractor quotes. The Owner will approve or reject the change request within two (2) weeks. If the Owner elects to proceed with the change, the Construction Manager will prepare formal change orders to the various trade contractors involved in the change and reference in all formal change orders the original change order request number.

2. Field Change: Contractor shall immediately notify the Construction Manager of a change due to field conditions or site conditions. If documents cannot be prepared for pricing due to schedule constraints, the Construction Manager will make every effort in estimating the field change. If the Owner and Construction Manager agree that certain field changes should be handled on a time and material basis, the Construction Manager will closely monitor the Contractor's labor and material affecting this change. At the completion of the work a formal change order will be issued.

3. Contractor Change: If a Contractor initiates a change order for work not included in the Contract, the Construction Manager and Architect will research the validity of the request, verify quantities and pricing and submit to the Owner for approval on a change order request.

B. The additional cost, or credit to the Owner resulting from a change in the Work shall be by mutual agreement of the Owner, Contractor, Construction Manager and the Architect.

3. PROCESSING A CHANGE ORDER

A. The Contractor will fill in the Change Order Request & Execution Form (COREF) with a brief description of the change, any time extension, and cost changes.

B. The Contractor will attach to the COREF copies of the written quotations from the trade contractors, Contractors, and suppliers. The Labor Detail Sheet and the Change Order Detail forms must be added as an attachment to the COREF. The Contractor and each sub-tier contractor (as applicable) must fill out the Labor Detail Sheet and Change Order Detail Sheet. Samples of these forms are attached.

C. In all cases, this cost or credit shall be based on the "DPE" wages required and the "invoice price" of the materials/equipment needed.

D. "DPE" shall be defined to mean "direct personnel expense". Direct payroll expense includes direct salary plus customary fringe benefits (prevailing wage rates) and documented statutory costs such as workman's compensation insurance, FICA, and unemployment insurance.

1. "Fringe Benefit" is any medical, life or disability insurance, paid time off, etc.

2. "Worker's Compensation" is the insurance required for injuries including medical leave, etc.

3. "FICA" is the costs association with Social Security and Medicare insurance.

4. "Unemployment insurance" is the cost associated with the governmental assessment for employee's unemployment benefits.

E. "Invoice price" of materials/equipment shall be defined to mean the actual cost of materials and/or equipment that is paid by the Contractor (or Subcontractor) to a material distributor, direct factory vendor, store, material provider, or equipment leasing entity.

F. In addition to the above, the Contractor is allowed markup for overhead and profit on additional work performed as outlined in Specification Section 012613, Contractor Compensation.

G. Building Blok Procedures: The Contractor will submit all change order requests and supporting documentation via the Building Blok web-based project management system. Each Contractor will be issued a unique login and password. Each contractor must submit the information as follows:

1. Create a new change order, from your "To-Do List" by clicking on the "Create Issue" tab in the upper right corner and select "Change Order Request".

2. The Contractor will enter a brief description of the change in the "Summary" block. A detailed description of the change will be entered in the "Description of Change" block, to include any changes to documents or time extension. The cost of the change will be entered in the "Total Cost Change" block.

3. The Labor Detail Sheet and the Change Order Detail forms must be added as an attachment to the request. The Contractor and each sub-tier contractor (as applicable) must fill out the Labor Detail Sheet and Change Order Detail Sheet. Samples of these forms are included behind this section. In addition to these forms, the Contractor also must attach any material and equipment rental quotations. All of these documents should be scanned and saved as a PDF file. Click on the "Browse" box to upload the file. Be sure to wait until Building Blok tells you the file was "Uploaded Successfully".

4. Once the information is entered on the form and the proper attachments are uploaded, the contractor will click "Save". The Contractor will be prompted to enter their password to approve an electronic signature. Once you save the request you will have an opportunity to check it before submitting it to the CM. After you verify the COREF is correct click "Recommend Approval" to submit the change request to the CM. The Contractor will then be prompted to re-enter the password to approve an electronic signature and complete the submission request. Click on "Home" in the upper left corner to make sure the change order does not appear on your To-Do List.

5. The Change Order Request will then be reviewed by the CM Project Manager and Recommended for Approval, Rejected, or returned to the Contractor for additional information. Once the Construction Manager, Owner, and Architect have approved the request all parties will receive an email from Building Blok notifying them that a fully executed Change Order and Contract Recalculation Form can be downloaded from Building Blok. Hard copies of the executed change order and recalculation form will not be provided by the CM.

It is to be clearly stated that no extra work shall commence without an approval from the Owner or Construction Manager or Owner's representative.

END OF SECTION

CHANGE ORDER REQUEST & EXECUTION FORM

110 South Poplar Street
Suite 400
Wilmington, DE 19801
Tel. 302-421-5700
Fax 302-421-5715

DATE:
CONTRACT:
CONTRACTOR:
PROJECT NAME:
REQUEST NUMBER:
CHANGE ORDER NUMBER:
STATE PO NUMBER:

The following is a summary of the request submitted by the contractor as described above. All supporting documents have been attached and described herewith. This summary shall contain a total amount of compensation requested by the contractor as well as any request for an extension in contract time. It shall be understood that the amounts described below shall remain valid for a period of sixty days from the date described above unless otherwise stated.

A detailed breakdown of Labor, material, equipment, and subcontract costs must be attached to be considered for review.

1. Summary Description(s):

2. Changes to the Contract Drawings:

3. Changes to the Project Manual:

4. Total Cost Change:

5. Total Time Change:

REVIEWED

This request has been reviewed and____approval_____disapproval is recommended by:

Name	Title	Date

APPROVED

This change order request is not approved until executed by all parties bound by a contractual relationship. Upon execution it shall represent a modification to the agreement and is subject to all terms and conditions of the contract documents.

Contractor:	Architect:
Signed By:	Signed By:
Title:	Title:
Date:	Date:
EDiS Company	Owner:
Signed By:	Signed By:
Title:	Title:
Date:	Date:

CHANGE ORDER DETAIL FORM

(Provided by contractor, subcontractor or sub tier contractor)

DATE SUBMITTED:

CONTRACT:

CONTRACTOR:

PROJECT NAME: Colonial School District - John G. Leach School

CHANGE ORDER REQUEST #:

LABOR SECTION

TRADESMAN(s):	LABOR HOURS	RATE (per schedule)	SUBTOTAL
Subtotal			

MATERIAL SECTION

MATERIAL:	QUANTITY	UNIT COST	SUBTOTAL
Subtotal			

EQUIPMENT SECTION

EQUIPMENT:	QUANTITY	UNIT COST	SUBTOTAL
Subtotal			

SUBTOTAL	
SUBCONTRACTOR/ SUB TIER*	
OH & PROFIT (10% on sub/sub tier only))	
BOND COST	
OH & PROFIT (15% on own work)	
GRAND TOTAL	

LABOR DETAIL FORM

(Provided by contractor, subcontractor, or sub-tier contractor)

DATE:

CONTRACT:

CONTRACTOR:

PROJECT NAME: Colonial School District - John G. Leach School

CHANGE ORDER REQUEST #:

CLASSIFICATION:			
Base Wage Rate:			
Health Insurance			
Holidays			
Sick Days			
Life Insurance			
Disability Insurance			
Dental Insurance			
Company Vehicle			
401K			
Education			
Other (*specify below*)			
Subtotal			
Posted Prevailing Rate			
FICA (Social Security & Medicare)			
SUTA (State Unemployment)			
FUTA (Federal Unemployment)			
General Liability Insurance			
Worker's Compensation			
Total Wage Rate			

SECTION 012613 - CONTRACTOR COMPENSATION

1. GENERAL

A. The Contractor agrees to perform any additional Work, for the net cost of materials and labor (including wages paid, payroll taxes, and all insurance) plus the following percentage for all of his overhead and profit, which includes Field Supervision:

The percentages to be added or allowed for any Work change involving both added Work and omitted Work shall be applied only to the net difference in cost.

1. 15% mark-up (10% overhead and 5% profit) by the Contractor on Work performed by his own forces.

2. For work done by a Subcontractor, 10% for subcontractor overhead and 5% for subcontractor profit to which the Contractor may add 7.5% for his overhead and profit combined.

3. Contractor mark-up shall include supervision, home and field overhead, all self-owned small tools and equipment.

B. When the Contractor is directed to perform overtime work at the CM (Owner) expense to accelerate contractual work, the cost for same shall only be the actual premium costs incurred by the Contractor.

END OF SECTION

SECTION 012900 - PAYMENT PROCEDURES

1. GENERAL PROVISIONS

   A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.

   B. Refer to provisions in AIA Document A232 - 2019 Edition, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, CONSTRUCTION MANAGER AS ADVISOR EDITION, for requirements in addition to those specified in Division 1.

   C. For work being constructed under separate prime contracts, provisions of this Section apply to each contract being bid.

2. REQUIREMENTS INCLUDED

   A. Submit Applications for Payment to Construction Manager in accordance with the schedule and procedures established in the Contract Documents.

3. RELATED REQUIREMENTS

   A. Owner-Contractor Agreement.

   B. Conditions of the Contract: Article 9 PAYMENTS AND COMPLETION.

   C. Section 01 31 13: Project Coordination Meetings

   D. Section 01 33 00: Submittal Procedures

   E. Section 01 77 00: Closeout Procedures

4. FORMAT AND DATA REQUIRED

      A. Submit itemized applications inputted into Building Blok (EDiS' Web-Based Project Management software), examples of which will be furnished to the Contractor at the Pre-Construction meeting.

      B. Provide itemized data on Continuation Sheet:

         1. Format, schedules, line items and values: Duplicates of those of the schedule of values previously accepted by the Construction Manager.

5. PREPARATION OF APPLICATIONS FOR PROGRESS PAYMENTS

A. Form: AIA Document G702

1. Fill in required information, including that for Change Orders executed prior to date of submittal of application.

2. Fill in summary of dollar values to agree with respective totals indicated on Continuation Sheets.

B. Continuation Sheets:

1. Line items of components of Work will be subject to Construction Manager/Owner's review and approval under the Provisions of Section 013300 - SUBMITTALS, and the General Conditions. Continuation Sheets shall follow Schedule of Values submitted at the start of the job.

2. Fill in total list of all scheduled components of Work, with item number and scheduled dollar value for each item. Fill in values of work completed in the period.

3. Fill in dollar value in each column for each scheduled line item when work has been performed or products stored; round off values to nearest dollar.

4. List each Change Order executed prior to date of submission, at the end of the Continuation Sheets; list by Change Order Number, and description, as for an original component item of work.

5. Contractor is to include a line item for "Closeout Documents" equaling 3.5% of their contract value.

6. PREPARATION OF APPLICATION FOR FINAL PAYMENT

A. Fill in Application form as specified in progress payments.

7. SUBMITTAL PROCEDURES

A. Complete Invoice:

1. Submit completed Application to the Construction Manager by the date stipulated in the Project Manual.

B. Number: Submit 3 hard copies of each Building Blok invoice signed and notarized payment application.

END OF SECTION

SECTION 013113 - PROJECT COORDINATION MEETING

1. PROJECT COORDINATION MEETING

   A. An on-site project coordination meeting will be held on a biweekly basis throughout the project construction period.

2. ATTENDANCE

   A. Attendance at the project coordination meeting is mandatory of each Contractor or major supplier on the project.

   B. The representative of the Contractor shall be the Project Manager and field superintendent unless a substitute representative has been approved by the Construction Manager.

   C. Contractor will begin attending the Project Coordination Meetings at least 4 weeks prior to mobilization on site and will continue until the Contractor has fulfilled the obligations of his Contract.

3. AGENDA

   A. The Construction Manager will set the agenda for the biweekly Project Coordination Meeting.

   B. At a minimum, the Contractor shall be prepared to discuss the following:

      1. Actual vs. as planned progress for the prior two-week period.

      2. Planned construction activities for the next four weeks.

      3. Contract document clarifications.

      4. Coordination items with other contractors.

      5. Quality Control.

      6. Recently issued change orders.

      7. Potential change orders.

      8. Submittals and shop drawings.

      9. Other items requiring Construction Manager's attention.

END OF SECTION

SECTION 013119 – PRE-INSTALLATION MEETINGS

1. PRE-INSTALLATION MEETINGS

   A. An on-site pre-installation meeting will be held at least two weeks prior to commencement of installation of work.

2. ATTENDANCE

   A. Attendance at the pre-installation meeting is mandatory of each Contractor and/or major supplier as required for each specific meeting listed below.

   B. The following individuals shall attend these meetings:
      - Contractors' Project Manager
      - Contractors' Field Superintendent
      - Contractors' Safety Representative (as needed)
      - Key Subcontractors, Suppliers, and Vendors
      - EDiS Project Manager
      - EDiS Field Manager
      - EDiS Safety Director (as needed)
      - EDiS MEP Specialist (as needed)
      - Owner's Representative (as needed)
      - Architect/Engineer (as needed)
      - Governmental Agency Representatives (as needed)
      - Testing/Inspection Agency Representatives (as needed)
      - Utility Company Representatives (as needed)

3. SUBMITTALS

   A. Each contractor is responsible to have all submittals and mock-ups, as related to the pre-installation meeting scope of work, submitted and approved prior to commencement of the pre-installation meeting.

4. LIST OF REQUIRED MEETINGS

   - Sitework – Erosion and Sediment Control
   - Sitework
     - Bulk Grading
     - Asphalt Paving
     - Concrete Curbs, Gutters, & Sidewalks
     - Site Utilities
   - Landscaping
   - Foundations & Concrete Slabs
     - Underslab Utilities
   - Structural Steel Erection & Miscellaneous Metals OSHA mandated Safety Meeting
   - Roofing OSHA mandated Safety Meeting

- Building Envelope
  - Exterior Structural Stud Assembly
  - Masonry & Stone
  - Curtain Wall/Glazing/Storefronts
  - Metal Wall Panels
- Doors/Frames/Hardware
  - Interior Glass and Glazing
  - Keying
- Finish Carpentry & Millwork
- Finishes
  - Acoustical Ceilings/Acoustical Wall Panels
  - Paint and VWC
  - Flooring (VCT, Carpet)
  - Terrazzo Flooring
- Kitchen Equipment
  - Residential Kitchen Equipment
- Athletic Courts and Equipment
- Partition Walls
  - Metal Studs
  - Drywall
  - Insulation
  - Doors/Frames/Hardware
- Loading Dock Equipment
- Fire Protection
  - Fire Sprinkler Systems
  - Fire Alarm Systems
  - Ansul System
- MEP Coordination
  - Mechanical Piping Roughin
  - Plumbing Roughin
  - Insulation
  - Electrical Roughin
  - Electrical – Bonding, grounding, lightning protection
  - Automatic Temperature Controls
  - Commissioning
- Special Systems
  - Voice/Data Low Voltage Wiring
  - Security System
  - Audio-Visual Equipment
- Owner Furnished Equipment
- Final Cleaning

5. AGENDA

   A. At a minimum, the Contractor shall be prepared to discuss the items as listed on the agenda template shown on the following page:

PROJECT: CSD – Leach School

PRE-INSTALLATION MEETING:

A. ATTENDEES:

NAME	COMPANY	WORK ITEM	CONTRACT

B. TESTING & INSPECTION REQUIREMENTS
(THESE REQUIREMENTS COME FROM THE PROJECT MANUAL)

C. REVIEW CONTRACT DRAWINGS AND SPECIFICATIONS

Drawing / Spec No.	Comments / Conflicts

D. REVIEW SCOPES OF WORK ***(SEE SECTION 011100 IN THE PROJECT MANUAL)***

E. REVIEW RELEVANT RFI'S

F. REVIEW SUBMITTALS ***(SEE THE SUBMITTAL REGISTER)***

G. REVIEW MATERIALS AND DELIVERIES

H. REVIEW SCHEDULE AND SEQUENCE OF WORK

I. JOB SITE SAFETY *(SEE THE CONTRACTOR'S SAFETY PROGRAM OR OSHA)*

- Safety Plans must be submitted before the start of work
- Certificates of Insurance need to be submitted before the start of work
- Minimum PPE – Hardhats, steel toe boots, safety glasses
- Lock-out, Tag, Test and Try ALL utilities is critical before the start of demolition
- Signage & HAZCOM Requirements
- Potential Hazards
  - Excavations >4 ft
  - Slips/trips/falls
  - Existing utilities to remain and protected
  - Overhead debris
  - Power tools
  - Heavy equipment

J. COORDINATION WITH OTHER TRADES

K. ACTION ITEMS AND RESPONSIBILITY

END OF SECTION

SECTION 013125– WEB-BASED PROJECT MANAGEMENT SYSTEM

1. GENERAL PROVISIONS

   A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.

   B. Refer to provisions in AIA Document A232 – 2019 EDITION, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, for requirements in addition to those specified in Division 1.

   C. Refer to Scope Information Sheets for all contracts bound in the Project Manual under Section 011100 - SUMMARY OF WORK. The Scope Information Sheets describe generally the work included in each contract, but the work is not necessarily limited to that described.

   D. All Contractors shall use Internet/Web-based project management software to transmit documents, track, and otherwise manage this project.

   E. Use of this project management software will not change any contractual responsibilities of the construction team members.

2. DEFINITIONS

   A. System: A real time web-based software that shares data, translates data, organizes data, facilitates communication, archives actions, and offers scheduling prompts to identified Users.

   B. Users: Authorized participants of this project furnished with a unique password and authorized to access the system to view/input/export data. Owner, Construction Manager, Architect, and the Contractors are all Users. Other Users may be added as necessary.

   C. Contacts: Entities identified to automatically receive specific transmissions or entities selected to receive specific information sent by the system through to an e-mail address.

   D. Signees: Those individuals identified, by the Contractors, authorized to sign change orders and payment applications via electronic signature. This electronic signature is as contractually binding as an original signature on paper.

3. USE OF SYSTEM

   A. The use of the system is mandatory for the documentation of the transmittal of all non-oral information, even if the actual transmission of the information is by another means.

   B. The use of the system will be mandatory by the Contractors to send, retrieve, and respond to data.

C. In addition to this web-based project management system, the Contractors will be required to use electronic mail (email) for day-to-day communication and correspondence. Email will be the primary means of transmitting written communication (i.e. meeting minutes, draft pay applications, etc.).

4. QUALITY ASSURANCE

A. A three-hour training session in the use of the software for this project will be offered by the Construction Manager at a location convenient to the project site. Attendance by one member of each Contractor's organization is mandatory. Additional attendees may enroll based on availability of training space. All attendees must have a working knowledge of computers. Training can not begin until three working days after the receipt of the submittals indicated below.

B. Technical assistance will be provided by on-line help, email, or telephone for all Users throughout the life of the project.

5. SUBMITTALS

A. Submit to the Construction Manager, within 5 days following the receipt of the letter of intent to award, in an electronic template, the following:

1. Electronic logo of organization (as needed)
2. Names, mailing address and electronic address of its Users and Contacts.
3. Designation the role/responsibility for each User

6. SOFTWARE AND HARDWARE REQUIREMENTS

A. Each User shall provide and maintain a computer with high-speed internet access and an email address. The computer shall have a high-speed internet browser (Internet Explorer 8.0 or higher, Firefox version 3.6.12 or higher, Google Chrome or Safari version 5.0 or higher) and a high speed cable Internet access, high speed DSL or T1 line.

B. License(s) to Use System - Each Contractor will be provided unlimited licenses to use the system for this project. Each license will allow secure unlimited usage from the notice to proceed until the original contract completion date.

7. SYSTEM DESCRIPTION

A. The web-based project management system is a "secure, real-time, interactive, centralized database" specifically established and maintained for the management of this construction project. The product is designed to facilitate communication and improve the time management of its users by facilitating the sharing of information. Information will be available 24/7, from any computer meeting the specifications listed above. The information is fully protected. The electronic platform allows information to be transmitted across the internet reducing printing and postage costs and the time associated with such activities.

B. The system contains a directory of the project participants.

C. The system includes templates, with the CM's letterhead, for each document created inside the system. The template allows the use of "pull down" menus to complete significant portions of each document.

D. The system allows the templates (and attached documents created outside the system) to be distributed to Users and Contacts.

E. The System contains "translation software" to permit the viewing (and marking) of documents created outside the system. The system can view documents created by different software programs and can deliver images of its translation to any computer meeting the criteria listed above.

F. The system can be personalized by the Construction Manager to automatically send e-mail notices upon issuance of certain documents if such a practice facilitates the User's business needs.

G. The system is the product of ***Building Blok, LLC*** (www.buildingblok.com) and will be continuously updated.

H. The Construction Manager will administer the Building Blok User accounts for this project.

8. DOCUMENTS CREATED INSIDE THE SYSTEM

A. The following documents shall be created on templates inside the system.

1. Transmittals for submittals processed in the system. The transmittals are automatically created by the system when the submittal is uploaded.
2. Submittal Register showing all of the submittals required of the contract, assigned to each Contractor.
3. Submittal Log: The CM will maintain submittal log after it is initialized.
4. RFI (Requests for Information)
5. Change Orders
6. RFP (Requests for Proposal)
7. ASI (Architect's Supplemental Instructions)
8. Tasks & Memos as determined by the CM
9. Payment Applications
10. Closeout Tracking Log

B. The following documents may, at each Users option, be created on the system.

1. Morning & Afternoon Activity Reports generated by the system
2. E-mails: Contacts that do not have access to the system may be sent information from the system, by the system.
3. Reports of information on the system

4. Project Notices: “Broadcast” messages can be sent to other Users system entry screen.

9. DOCUMENTS CREATED OUTSIDE THE SYSTEM AND DISTRIBUTED BY THE SYSTEM

A. The following documents are expected to be created outside the system and distributed through the system. The actual documents may be scanned or electronically attached to the transmittal.

1. Technical Submittals: Shop drawings, product data, testing reports, certifications, installation instructions, operation & maintenance manuals, will be submitted and distributed through the system. The Architect will return all submissions through the system electronically. The Construction Manager will distribute submittals (after Architect’s action) electronically. Contractors may download and distribute submittals to their subcontractors and suppliers or elect to print paper copies for distribution, or both.
2. Photographs: Digital photographs and scanned images can be loaded onto the system and shared.
3. Schedule of Values/ Payment Applications: (The “pencil” review of these documents can occur inside the system).
4. Change Orders: (The “pencil” review of these documents can occur inside the system.)
5. Schedules: The schedule document(s) will be available for review on the system.
6. Data created in other software may be uploaded to the system electronically.

10. DOCUMENTS CREATED OUTSIDE THE SYSTEM AND DISTRIBUTED OUTSIDE THE SYSTEM

A. The following documents are expected to be created outside the system and distributed outside the system. The actual documents may be scanned or electronically attached to the transmittal.

1. Schedules: The Construction Manager will develop the Master Schedule through Microsoft Project 2003. The schedule will be distributed either through hard copies at meetings or through email.
2. Product samples, color samples, physical samples are still required to be provided per the technical specifications, however, the transmittal documenting the distribution shall be done inside the system and submitted electronically and printed to accompany the actual submission.
3. Meeting minutes will be created using Microsoft Word 2003 and distributed through hard copies at meetings or through email.
4. AIA closeout documents, which require an “original” signature, will created and distributed outside the system.

END OF SECTION

SECTION 013216 - CONSTRUCTION SCHEDULE

1. PRE-BID CONSTRUCTION SCHEDULE

A. Time is a critical element of this Project. By entering a bid, the Contractor agrees to adhere to the intermediate Milestone Dates and Dates of Substantial and Final Completion established herein. The Contractor also understands that all work must be performed in an orderly and closely coordinated sequence in order to achieve the specified Milestones and Completion Dates, and the Contractor hereby agrees to perform his work in conformance with the Pre-Bid Construction Schedule established herein, or with the then current and approved Project Construction Schedule as amended from time to time by the Construction Manager.

B. The Pre-Bid Construction Schedule is a milestone schedule with durations that identify portions of the project that must be completed. This schedule includes allowances for time lost due to adverse and abnormal weather conditions, other than floods, hurricanes, tornadoes, lightening and other like acts of God. The Contractor understands and agrees that it shall not be entitled to any extensions of the Contract Time or adjustment to the Contract Sum, except as allowed in the General Conditions of the Contract for Construction. The Contractor further acknowledges that the Work may be required to be performed during the winter season, that conditions during this season may be adverse and abnormal, but that such conditions will not be the basis for an extension of the Contract Time or adjustment to the Contract Sum. By submitting a bid, each Contractor is certifying that they can complete their work within the durations, or less time, outlined in the milestone schedule and its bid includes any and all costs associated with the schedule. This includes one Contractor completing their work in conjunction with another Contractor's work (i.e. electrical conduits installed in CMU walls). Each Contractor agrees to provide sufficient labor, crew size, equipment and/or work overtime, weekends, or shiftwork as necessary to meet the activity durations on this schedule and subsequently the latest coordinated Project Construction Schedule.

2. SCHEDULING OF THE WORK AFTER AWARD OF CONTRACT

A. After award of Contract, or issuance of a Notice to Proceed, the Contractor will meet with the Construction Manager to review the Pre-Bid Construction Schedule, and the overall project plan for construction. Following the above review, the Contractor will meet with each subcontractor and supplier to view the detailed plans for performing his Work. Following these meetings and within fourteen (14) days after award of the Contract or issuance of a Notice to Proceed, the Contractor shall prepare and submit for the Construction Manager's approval a Work Schedule providing for the expeditious, timely and practical execution of the Work. The Contractor's Work Schedule shall include activity descriptions and durations for shop drawings, fabrication, delivery, and installation. The Contractor's Work Schedule shall be organized by Area, Building, Phase, and/or Floor as required by the Construction Manager. If the Construction Manager so requests, the Contractor shall provide adequate explanation regarding crew sizes, production rates and similar data used to arrive at the durations and sequences. If the Contractor fails to provide a work schedule for their activities then they will be held to the Project Construction Schedule developed and updated by the Construction Manager.

B. The Construction Manager shall review the Contractor's Work Schedule, coordinate it with the

separate work by other contractors, the Owner, and the Construction Manager, and after coordination, shall incorporate it into the approved Project Construction Schedule.

C. After all Contractors submit their Work Schedules and the schedules have been incorporated into the overall Project Construction Schedule a Schedule Charrette will be held by the Construction Manager. Each Contractor is required to participate in the Schedule Charrette in order to produce a coordinated Project Construction Schedule. The Construction Manager will have the final authority concerning the sequence of work, priorities or work, and activity durations. The approved coordinated Project Construction Schedule shall be issued to the Contractors and each Contractor shall perform their Work in conformity therewith.

C. The Contractor shall submit proposed schedule revisions and obtain the written approval of the Construction Manager therefore before deviating from the Project Construction Schedule.

D. The Construction Manager will incorporate approved schedule revisions into the Project Construction Schedule and shall otherwise update and revise the Project Construction Schedule as the Construction Manager, at his sole discretion, deems necessary. Each Contractor acknowledges that Construction Manager may modify, change, or alter the sequence, duration, start dates, completion dates to maintain the progress of the work. Contractor agrees to perform the work in accordance with the revised schedules and that modification of the schedule or sequence of the work by the Construction Manager shall not be the basis of any claim by the Contractor for damages or costs.

E. Weather Delays: The project substantial completion date, shall only be adjusted due to extreme weather conditions that are above and beyond the following "Adverse Weather Days" already accounted for in the Pre-Bid Construction Schedule. These adverse weather days are based on a seven day week and come from the DelDOT Standards:

a. January (12), February (10), March (5), April (5), May (4), June (2), July (4), August (3), September (4), October (3), November (2), and December (6).
b. Time extension due to weather must be related to critical path activities.
c. Delays due to weather must be reported by the Contractor on the day they occur on the Contractor's daily report.
d. Any time lost during the work week must be made up the same week by overtime and/or working weekends. The Owner will not be responsible for additional costs for overtime.

3. ADHERENCE TO THE SCHEDULE

A. The Contractor shall start each part of its Work on the date designated for start in the approved Project Construction Schedule unless advised by the Construction Manager. The Contractor shall carry the Work forward expeditiously with adequate forces, equipment, and materials, and shall complete each part of his work on or before the date designated in the approved Project Construction Schedule.

B. If the Construction Manager determines that the Contractor is behind schedule, the Construction

Manager shall have the right to require that the Contractor take steps, at the Contractor's expense, to accelerate its Work. Such steps shall include increases in manpower, equipment, and materials and/or overtime as the Construction Manager may deem necessary. If any work is not started or completed within five (5) calendar days of the schedule date in the latest Project Construction Schedule, the Construction Manager shall have the right to direct the Contractor to expedite their work by whatever means the Construction Manager deems necessary to regain the schedule, without additional compensation to the Contractor. If any work falls behind schedule more than ten (10) days, the Construction Manager shall have the right to perform the work or have the work performed by whatever means the Construction Manager deems necessary. The costs incurred by the Construction Manager in order to "maintain the Project Construction Schedule" shall be reimbursed by the Contractor or Contractors causing the delay. If the Contractor fails to comply with the Construction Manager's instructions relating to improved rate of progress, the Contractor may be held in default under the appropriate provisions of the General Conditions of the Contract.

C. Each Contractor shall, if directed by the Construction Manager, provide the Construction Manager a two-week look ahead of anticipated manpower showing the number of men, classification, and anticipated work.

D. Each Contractor must schedule their manpower to work on all available work at a given time. Contractors must not assume that they have an entire work area available at one time or exclusive to their work. Working simultaneously in and around other trades is required. Therefore, if an area of the building is ready for the Contractor's work to begin or continue the Contractor must have manpower onsite working.

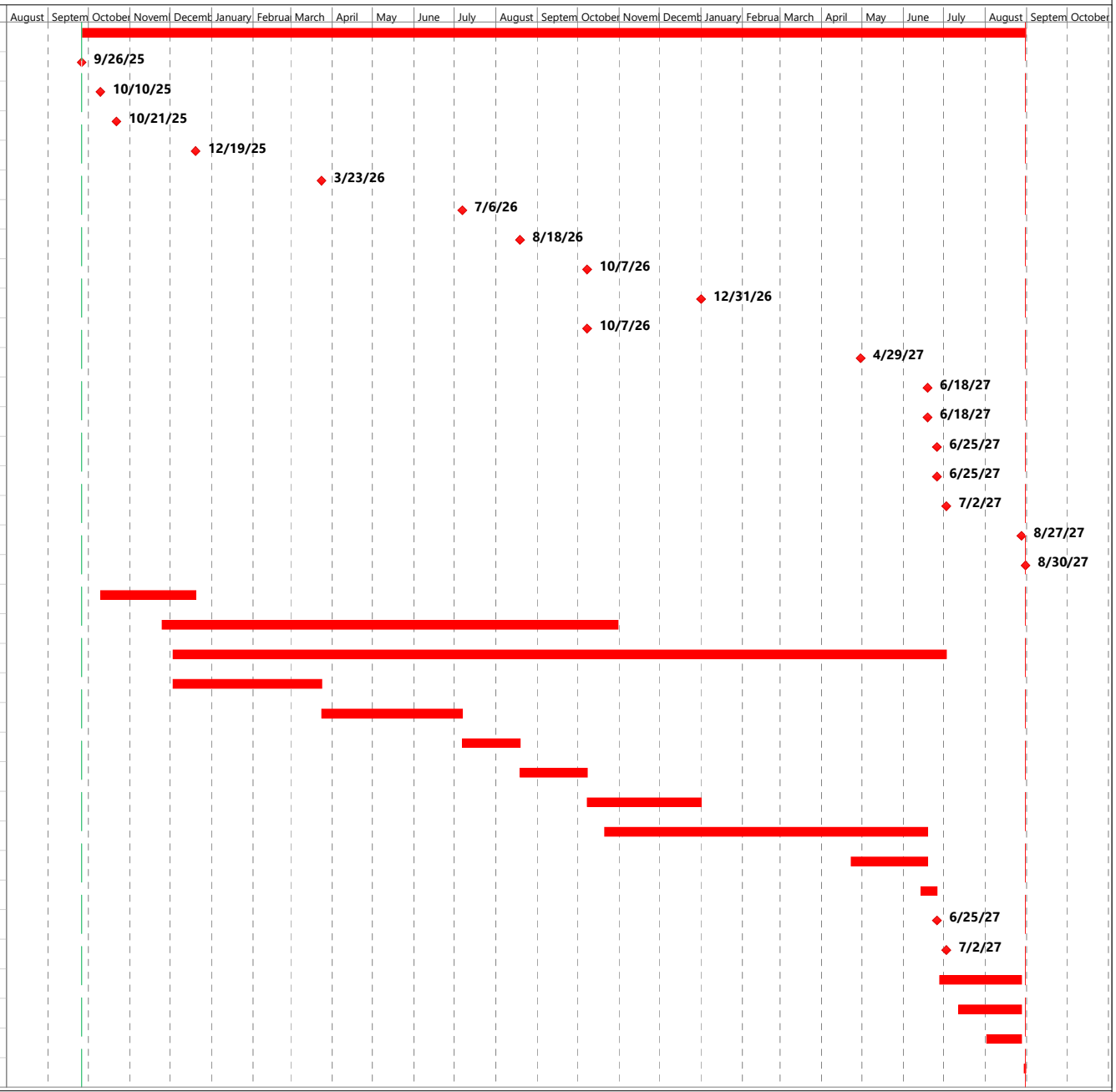
E. If a Contractor misses any portion of a workday due to weather, manpower, lack of materials, failure to plan, or scheduling conflicts, they must make-up this lost time on overtime or Saturday. If two or more days are lost in the same work week, the Contractor must work overtime, the immediate Saturday and the Saturdays following the week to make up the lost days. Failure to provide sufficient manpower during the normal week days may result in charges for supervision by EDiS Company, at the discretion of EDiS Company.

F. All punchlist work and project closeout documentation shall be completed within twenty-one (21) calendar days of the Substantial Completion date. Any open punchlist items after this date will be completed by EDiS Company and back charged to the responsible Contractor.

END OF SECTION

COLONIAL SCHOOL DISTRICT - JOHN G. LEACH SCHOOL

ID	Task Name	Duration	Start	Finish
1	**Project Milestones**	**491 days**	**9/26/25**	**8/30/27**
2	Issue Design Documents	0 days	9/26/25	9/26/25
3	Issue Bid Packages	0 days	10/10/25	10/10/25
4	Pre-Bid Meeting	0 days	10/21/25	10/21/25
5	Notice to Proceed	0 days	12/19/25	12/19/25
6	Early Sitework & Utilities Completed	0 days	3/23/26	3/23/26
7	Footing & Foundations Completed	0 days	7/6/26	7/6/26
8	Structural Steel Completed	0 days	8/18/26	8/18/26
9	Roofing Completed	0 days	10/7/26	10/7/26
10	Exterior Façade Completed	0 days	12/31/26	12/31/26
11	Permanent Building Power	0 days	10/7/26	10/7/26
12	Building Conditioned	0 days	4/29/27	4/29/27
13	Interior Finishes Completed	0 days	6/18/27	6/18/27
14	Final Sitework Completed	0 days	6/18/27	6/18/27
15	TAB & Commissioning Completed	0 days	6/25/27	6/25/27
16	Substantial Completion	0 days	6/25/27	6/25/27
17	Certificate of Occupancy	0 days	7/2/27	7/2/27
18	Owner Turnover	0 days	8/27/27	8/27/27
19	Start of School	0 days	8/30/27	8/30/27
20	**Subcontractor Procurement**	**50 days**	**10/10/25**	**12/19/25**
22	**Submittals, Shop Drawing & Material Procureme**	**238 days**	**11/25/25**	**10/30/26**
24	**Construction**	**404 days**	**12/3/25**	**7/2/27**
25	Early Sitework & Utilities	77 days	12/3/25	3/23/26
26	Footings, Foundations, Building Utilities & SOG	73 days	3/24/26	7/6/26
27	Structural Steel	31 days	7/7/26	8/18/26
28	Roofing	35 days	8/19/26	10/7/26
29	Exterior Façade	59 days	10/8/26	12/31/26
30	Interior Finishes	169 days	10/21/26	6/18/27
31	Final Sitework	40 days	4/23/27	6/18/27
32	TAB & Commissioning	10 days	6/14/27	6/25/27
33	Substantial Completion	0 days	6/25/27	6/25/27
34	Certificate of Occupancy	0 days	7/2/27	7/2/27
35	**Project Closeout**	**44 days**	**6/28/27**	**8/27/27**
37	**Owner Turnover**	**35 days**	**7/12/27**	**8/27/27**
39	**Owner Move-In**	**20 days**	**8/2/27**	**8/27/27**
41	**Start of School**	**1 day**	**8/30/27**	**8/30/27**



John G. Leach School
Date: 10/10/2025

SECTION 013219 - SUBMITTAL REGISTER

1. SUBMITTALS/SUBMITTAL REGISTER

A. The Contractor shall submit all items listed or specified within the sections of the Specifications included in its Work. Submittals shall include such items as: contractor's, manufacturer's or fabricator's drawings; descriptive literature including, but not limited to, catalog cuts, diagrams, operation charts or curves; test reports; samples, operations and maintenance manuals, including parts lists; certifications; warranties and other required submittals. Submittals pertinent to materials and equipment which are subject to advance approval shall be scheduled and made prior to the acquisition or the delivery thereof.

B. The Contractor shall carefully control procurement operations to assure that each individual submittal is made on or before the dates required for timely performance of its Work.

C. Within seven (7) days after award of Contract or issuance of Notice to Proceed, the Contractor shall execute and submit to the Construction Manager, seven (7) copies of the Submittal Register, on a form to be provided by the Construction Manager, on which shall be listed each item of equipment and material of each type for which fabricator's drawings and/or related descriptive data, test reports, samples, spare parts, operation and maintenance manuals, or other types of submittals required by the Specifications. The Submittal Register form shall be reproduced by the Contractor. The order of listing of items on the Register shall conform to the sequence of the items as they occur within the divisions. Drawings of component items forming a system or that are interrelated shall be scheduled to be correlated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time shall be allowed for review and approval and possible resubmittal of any item subject to approval, because no delay damages or time extensions will be allowed for time lost in late submittals or resubmittals. The Construction Manager and Architect/Engineer will review the Submittal Register for approval action. The approved Register will become a part of the Contract and Contractor will be subject to requirements thereof. The Contractor shall revise and/or update the Register monthly to take into account all changes in the Contract. Each such revised edition and/or revision to the Register shall be resubmitted to the Construction Manager. This Register shall be coordinated with related submittals of other Contractors.

2. SAMPLES

A. Submit tagged or labeled samples in triplicate, unless another quantity is otherwise specified by the Construction Manager.

B. Tags or labels shall be securely affixed and contain as a minimum the following information: Project Name, Contractor's Name, Contract Title and Number, Date, Transmittal Number, Product Manufacturer's or Fabricator's Name and Product Identifier.

END OF SECTION

SECTION 013226 - SUBCONTRACTOR DAILY REPORTS

1. SUBCONTRACTOR DAILY REPORTS

   A. The Subcontractor shall submit a Daily Report to the Construction Manager on the forms provided covering the following subjects:

      1. Work in Progress, including areas where work is being performed, nature of the operations in progress, and the manpower assigned.

      2. Extra Work (Time and Material) in progress.

      3. Materials Received.

      4. Trade labor breakdown including identification of all workers on site and the number of hours (or portions thereof) worked by each.

      5. Inspection Checklist (performed daily).

   B. The Subcontractor shall submit the Daily Report to the Construction Manager by 9:00 AM on the next workday following the workday covered in the Daily Report.

2. DAILY EXTRA WORK REPORT

   A. The Subcontractor shall submit on the form provided a Daily Extra Work Report on each day he performs authorized Extra Work on a time and material basis.

   B. A separate Daily Extra Work Report shall be submitted for each separate authorized Extra Work item done on a time and material basis.

   C. The Subcontractor shall submit his Daily Extra Work Report as an attachment to his Daily Report by 9:00 AM on the next workday following the workday covered in the Daily Extra Work Report.

3. SAMPLE DAILY REPORT

   A. A sample daily report follows this section for your reference.

END OF SECTION

SAFETY FORM: Contractors Daily Report

Project Name: CSD Leach School

Date:

Contractor:

Contract No. & Description:

Weather:

Foreman's Name:

TRADE	CLASS	MANPOWER COUNT	TOTAL MAN HOURS	TODAY'S DESCRIPTION / LOCATION OF WORK
	TOTAL			

** INDICATE: F = FOREMAN; J = JOURNEYMAN; A = APPRENTICE*

Work Status/Work Planned:

Construction Equipment:

Deliveries or Materials:

Machinery, tools, material, and equipment to be used:

Inspection of work area, machinery, tools, material, or equipment:

The use of any machinery, tool, material, or equipment which is not in compliance with any applicable requirements is prohibited. Such machine, tool, material or equipment shall either be identified as unsafe by tagging or locking the controls to render them inoperable or shall be physically removed from its place of operation.

Below is a general checklist of requirements for this project. Contractors must check off items that pertain to their contract and project tasks. Notify the EDiS Superintendent of any questionable conditions.

This checklist is not meant to be all inclusive. Please refer to OSHA regulations for compliance.

House Keeping
☐ Material Storage area orderly
☐ Lighting and ventilation sufficient
☐ Exits and Stairs have clear passage
☐ Walkways, corridors have clear passage
☐ Daily debris /trash removal

Personal Protective Equipment
☐ Hard Hats being worn
☐ Safety Glasses with side shields being worn
☐ Additional Eye/Face protection
☐ Respirators as required
☐ Hand protection as required
☐ Ear protection as required
☐ Inspected & Maintained
☐ Stored properly

Fire Prevention
☐ Fire extinguishers inspected / available
☐ Flammable / Combustibles properly stored
☐ Approved Fuel cans used and labeled
☐ Oxygen / Acetylenes stored properly
☐ Hot work permit (as necessary)
☐ Fire watch (as necessary)

Electrical
☐ GFI in use
☐ Three prong / double insulated tools
☐ Flexible cords in good condition
☐ Tools / Cords inspected before use

Excavations
☐ Miss Utility / locating service contacted
☐ Underground utilities visibly marked
☐ Properly Barricaded / covered
☐ Proper access / egress
☐ Ladders every 25'-0" distance
☐ Shored, sloped, benched as required
☐ Hazardous atmospheres tested (as necessary)
☐ Soil type determined
☐ Inspected by competent person
☐ Spoils/equipment 2 ft away
☐ Dewatering as needed

Ladders
☐ Inspected in good condition
☐ Correct pitch
☐ Extends 3'-0" above landing
☐ Opened, locked and secured / tied off
☐ Non-aluminum ladders used

Scaffolds
☐ Qualified Scaffold erector
☐ Guardrails, toe boards, and planking secured
☐ Appropriate signage provided
☐ Adequate cross bracing
☐ Scaffold training completed as required
☐ Free of debris
☐ Falling object protection in place
☐ Plumb/ level and on firm foundation
☐ Inspected as required per OSHA

Cranes
☐ Rated Load Capacity available in cab
☐ Swing Radius barricaded
☐ Appropriate certificates/decals/hand signals
☐ Daily inspection log completed
☐ Rigging inspected
☐ Electrical powerlines identified
☐ Ground condition reviewed
☐ Hazards below ground identified
☐ Fall Zone Monitored / identified

Fall Protection
☐ Fall protection plan available
☐ Harness / shock absorbing lanyard used
☐ Anchoring points adequate
☐ Perimeter barrier (as necessary)
☐ No holes observed
☐ 6'-0" Fall Protection utilized
☐ PFAS inspected
☐ Fall protection training completed

Paperwork
☐ SDS Information available
☐ Contractors Safety Policy provided & available
☐ Training Documentation as required

Other
☐ Drinking water provided
☐ CPR trained person on-site
☐ Trained operators utilizing equipment
☐ Working audible alarms on vehicles as required

Competent Person:

Print Name_____

SECTION 013300 – SUBMITTAL PROCEDURES

1. GENERAL PROVISIONS

   A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.

2. ITEMS TO BE SUBMITTED AT START OF WORK

   A. Performance/Labor and Material Payment Bond(s): One (1) copy of each bond simultaneously with the signed Agreement. See General Conditions Article 11.4 and Supplementary Conditions.

   B. Policies or Certificates of Insurance: Two (2) copies simultaneously with the signed Agreement. See General Conditions Article 11 and Supplementary Conditions.

   C. Contractor's License: Submit a copy of all business licenses required by local and state agencies.

   D. Contractor's Schedule of Values: Two (2) copies for approval within 21 days after the Agreement is signed. See General Conditions Article 9.2 and provisions in this Section.

   E. Contractor's Progress Schedule: Two (2) copies for review and reference within 21 days after the Agreement is signed. See General Conditions Article 3.10 and provisions in this Section.

   F. Submittal Schedule: Two (2) copies for review and reference within 21 days after the Agreement is signed. See provisions in this Section.

   G. Products List: Two (2) copies for approval within 30 days after the Agreement is signed. See provisions in Section 016200 - MATERIAL AND EQUIPMENT.

3. NON-RESIDENT CONTRACTOR & SUBCONTRACTORS BONDS

   A. Refer to requirements in Section 011100 - INSTRUCTIONS TO BIDDERS for filing of Surety Bonds with the Division of Revenue.

   B. If such bonds are required on this project, it will be the responsibility of the Contractor to produce evidence to the Construction Manager that they have been filed, or if not required, to supply a notarized statement that they are not required. This must be done within seven (7) days after award of Contract and in any event before construction starts.

4. RELATED REQUIREMENTS

   A. See Section 017700 - CONTRACT CLOSE OUT: for submittal requirements for Contract Close out.

5. SUBMITTALS

A. All submittals shall be directed to the Construction Manager in the manner directed by the Construction Manager, and paragraph 9 of this section. Contractor shall use the Contractor Submittal Form appended to this section.

B. Prepare a Submittal's Schedule for Shop Drawings, Product Data and Samples. Show:

1. The dates for Contractor's submittals.

2. The dates submittals will be required for Owner-furnished products.

3. The date approved submittals will be required from the Architect.

C. Should the Architect or Construction Manager elect to omit any items from the list of items to be reviewed, it shall not relieve the Contractor from compliance with the Contract Documents with regard to that item. In such instance, the Contractor may still elect to have submittals prepared for his own use without review by the Architect or Construction Manager.

6. SHOP DRAWINGS

A. Conform to provisions in General Conditions applying to Shop Drawings.

B. Present in a clear and thorough manner.

1. Identify details by reference to sheet and details, schedule or room numbers shown on Contract Drawings.

2. Maximum sheet size: 30″ x 42″.

7. PRODUCT DATA

A. Conform to provisions in General Conditions applying to Product Data.

B. Preparation:

1. Clearly mark each copy to specifically identify products or models pertinent to project.

2. Show performance characteristics and capacities.

3. Show dimensions and clearances required.

4. Show wiring or piping diagrams and controls.

C. Manufacturer's standard schematic drawings and diagrams:

1. Modify drawings and diagrams to delete information which is not applicable to the Work.

2. Supplement standard information to provide information specifically applicable to the Work.

8. SAMPLES

A. Conform to provisions in General Conditions applying to Samples.

B. Provide samples of sufficient size and quantity to clearly illustrate:

1 .Functional characteristics of the project, with integrally related parts and attachment devices.

2. Full range of color, texture and pattern.

C. Field samples and mock-ups; See requirements, if any, in other specification Sections.

9. SUBMITTAL REQUIREMENTS

A. Make submittals promptly through the Construction Manager in accordance with published schedule, and in such sequence as to cause no delay in the Work or in the Work of any other Subcontractor.

B. Number of submittals required.

1. Shop drawings: Submit digital working copies for each submittal on Building Blok. Digital copy will be marked up with corrections and comments, stamped and returned. Any hard copies required by the Subcontractor shall be made by him from the stamped returned digital copy.

2. Product Data: Submit digital working copies for each submittal on Building Blok. Digital copy will be marked up with corrections and comments, stamped and returned. Any hard copies required by the Subcontractor shall be made by him from the stamped returned digital copy.

3. Samples: Submit three (3) each. Contractor is to submit a submittal form and cover sheet with pictures of the samples on Building Blok for the design team to review and comment. When approved it will be returned to the Construction Manager to be retained at the site for reference use.

C. Submittals shall contain:

1. The date of submission and the dates of any previous submissions.

2. The Project title and number.

3. Contract identification.

4. The names of the Contractor, Supplier and Manufacturer.

5. Identification of the product, with the specification section number.

6. Field dimensions, clearly identified as such.

7. Relation to adjacent or critical features of the Work or materials.

8. Applicable standards, such as ASTM or Federal Specification numbers.

9. Identification of deviations from Contract Documents.

10. Identification of revisions on resubmittals.

11. An 8 inch x 3 inch blank space for Contractor and Architect's stamps.

12. Contractor's stamp, initialed or signed, certifying review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work and of Contract Documents. Submittals which have not been stamped with this stamp or its approved equivalent will be returned without being reviewed.

D. Shop Drawing coordination and interface with work of other Contracts and adjacent work is the responsibility of each individual Contractor.

E. All submittals shall be accompanied by the contractor's submittal form, a copy of which is part of this section. The contractor's submittal form must be completed in its entirety by the contractor.

10. RESUBMISSION REQUIREMENTS

A. Make any corrections or changes in the submittals required by the Architect and resubmit until approved.

B. Shop drawings and Product Data:

1. Revise initial drawings or data, and resubmit as specified for the initial submittal.

2. Indicate any changes which have been made other than those requested by the Architect.

C. Samples: Submit new samples as required for initial submittal.

11. FINAL DISTRIBUTION OF APPROVED SUBMITTALS

A. The Construction Manager will receive and log submittals and forward to Architect after processing.

B. The Construction Manager will distribute copies of Shop Drawings and Product Data which carry the Architect's stamp to:

1. Contractor that made submittal.

2. Jobsite File.

3. Record Document File.

4. Other Contractors, as required for coordination.

C. The Construction Manager will distribute samples as required.

D. The Contractor will distribute copies of Shop Drawings and Product Data which carry the Architect's stamp to:

1. Subcontractors.

2. Suppliers.

3. Fabricators.

12. SCHEDULE OF VALUES

A. Use AIA Document G703, Continuation Sheet to G702.

13. PROGRESS SCHEDULE

A. Prepare schedules in the form of a horizontal bar chart.

1. Provide separate horizontal bar chart for each trade or operation.

2. Horizontal time scale: Identify the first work day of each week.

3. Scale and spacing: To allow space for notations and future revisions.

4. Minimum sheet size 11 inches by 17 inches.

B. Format of listings: The chronological order of the start of each item of work.

C. Show the complete sequence of construction by activity.

D. Show the dates for the beginning, and completion of, each major element of construction such as:

1. Site clearing.

2. Site utilities.
3. Foundation work.
4. Structural framing.
5. Subcontractor work.
6. Equipment installation.

E. Show projected percentage of completion for each item as of the first day of each month.

F. Update Progress Schedule monthly and submit with Application for Payment and Schedule of values.

G. Indicate progress of each activity to date of submission.

H. Show changes occurring since previous submission of schedule:

1. Major changes in scope.
2. Activities modified since previous submission.
3. Revised projections of progress and completion.
4. Other identifiable changes.

I. Provide a narrative report as needed to define:

1. Problem areas, anticipated delays and the impact of the schedule.
2. Corrective action recommended, and its effect.
3. The effect of changes on schedules of other prime contractors.

J. Submit one reproducible transparency.

K. After review, distribute copies of the schedule to:

1. Jobsite File.
2. Subcontractors.
3. Architect.

4. Owner.

L. Instruct recipients to report promptly to the Contractor, in writing, any problems anticipated by the projections shown in the schedules.

END OF SECTION

EDiS COMPANY **CONTRACTOR SUBMITTAL FORM**

Contractor: **Contract #:**_____

Project Name: CSD – Leach School

To:

The following submittal (s) for the Architect's Review and Approval:

[ ] Shop Drawings [ ] Product Data [ ] Samples [ ] Samples [ ] Other (Identify)_____

[ ] Design Data [ ] Calculations [ ] Certificates [ ] Coordination Drawings [ ] Reports

[ ] Qualification Statements [ ] Other (Identify)_____

No. of Copies	Date	Submittal Number	Spec. Section #	Description of Submittal Items	Requested Return Date	EDIS Submittal Number (by EDIS)

Deviations from Contract Documents requirements are identified as follows:_____
_____

Remarks:_____

We hereby certify that _____(Contractor)_____has reviewed and approved submittals transmitted herewith for compliance and conformance with requirements of the Contract Documents.

Signed:_____ **Date:**_____

PU09, Revised 5/11

SECTION 013523 - SAFETY PROGRAM

1. GENERAL

A. The Contractor shall be responsible for initiating, maintaining, and supervising all safety activities and programs in connection with their Work.

B. Contractor shall be responsible for the safety of their personnel as well as their subcontractors.

C. Hard hats and safety glasses must be worn by all personnel on the jobsite, except in contractor's administrative office/trailer. All equipment must comply with OSHA standards. All job site personnel shall wear long pants, shirts (no tank tops), high visibility garments worn on the outer layer of clothing, and work boots.

2. SAFETY PROGRAM

A. Prior to commencing the work, the Contractor shall submit to the Construction Manager (1) electronic copy and (1) bound copy of its safety program and one (1) copy of SDS information in a 2" ringed notebook. One paper copy of the safety program and SDS will be retained by the Construction Manager in the field office.

B. The safety program shall outline those hazards peculiar to the Contractor's Work, and the steps to be taken to eliminate or reduce the risk of injury or loss due to those hazards. The program shall be project and site specific. Every Contractor shall implement and enforce its safety program, in accordance with all OSHA, Federal, State, and local laws.

C. Crystalline Silica Exposure Control Plan - Affected Contractors must provide a Written Exposure Control Plan for Respirable Crystalline Silica, meeting Subpart Z of the OSHA Construction Industry Regulations, that ensures each employee covered by this section of the Regulations can demonstrate knowledge and understanding meeting the requirements of the regulation, identify the competent person designated by the employer in accordance with the section, and otherwise comply with the requirements of this section of the Regulations.

D. Every Contractor shall designate a qualified Safety Supervisor and Alternate to implement the safety program. If during the progress of the work the Safety Supervisor is not performing their duties in a manner satisfactory to the Construction Manager the Contractor will designate a new qualified Safety Supervisor.

E. Every Contractor shall furnish the names and qualifications of the Primary and Alternate competent persons and qualified persons who may be required for their scope of work by the Contractor's safety procedures, and by federal, state and/or local regulations. Examples include competent persons and/or qualified persons for steel erection, excavation, scaffold erection,

confined space entry, crane and rigging operations, annual crane inspections, fall protection including horizontal lifeline systems, etc.

F. The employer shall verify compliance by preparing a written certification record. The written certification record shall contain the name or other identity of the employee trained, the date(s) of the training and the signature of the person who conducted the training or the signature of the employer. If the employer relies on training conducted by another employer or completed prior to the effective date of this section, the certification record shall include the date the employer determined the prior training was adequate rather than the date of actual training.

G. Copies of any and all documents, including information stored electronically, such as safety and health program handbooks and training certification records shall be provided when necessary.

1. The employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury. Please forward certification (document) of training for each employee on an EDiS project. The latest training certificate shall be maintained.

H. Contractor Daily Reports with Safety Inspection Checklist will be submitted daily to the Superintendent, verifying inspection of work area, machinery, equipment, and tools.

I. Prior to starting work on-site, the Contractor shall arrange with the on-site Superintendent to have their employees complete the EDiS Company Zero Accidents Safety Orientation program.

J. Every Contractor shall hold, at a minimum, weekly safety toolbox talks with all its employees every Monday at 12:30 PM. Every Contractor shall designate a responsible, qualified, and capable person to conduct these meetings. Contractor's safety supervisor or superintendent must submit to the Construction Manager weekly toolbox talks attendance sheets and the topics discussed.

3. SUBSTANCE ABUSE POLICY STATEMENT

A. The Construction Manager is committed to providing a safe work site environment for its employees and Contractors' employees. The Construction Manager does not condone or permit employees and Contractors' employees to use or be under the influence of drugs or alcohol while they are on any of the Construction Manager work sites. The Policy is as follows:

1. It is a violation of the Construction Manager's policy for employees and Contractors' employees to use, possess, sell, trade, or otherwise engage in the use of illegal drugs and alcohol.

2. It is a violation for employees and Contractors' employees to report to work while influenced

by illegal drugs or alcohol.

3. It is a violation for employees and Contractors' employees to use prescription drugs illegally (i.e., to use prescription drugs that have not been legally obtained) and to use prescription drugs in a manner other than the prescribed intentions.

4. Employees and Contractors' employees who are taking medication, which is prescribed by their physician, are expected to discuss potential side effects with their prescribing physician, as it relates to the work requirements.

B. Violations of this policy will require disciplinary action. If any employees or Contractors' employees are observed or suspected of being influenced by drugs or alcohol, they will be instructed to stop work and may be required to leave the work site.

4. EXECUTION

A. Every Contractor shall comply with all applicable federal, state and local laws, regulations and orders relating to occupational safety and health, and related procedures, and shall, to the extent permitted by law, indemnify and hold Construction Manager, Owner and Architect, and their respective directors, officers, or agents and employees, harmless from any and all liability, public or private, penalties, contractual or otherwise, losses, damages, costs, attorney's fees, expenses, causes of action, claims or judgments resulting from a claim filed by anyone in connection with the aforementioned acts, or any rule, regulation or order promulgated thereunder, arising out of the Contractor's Work, this Agreement or any subcontract executed in prosecution of the Work. Every Contractor further agrees in the event of a claim of violation of any such laws, regulations, orders, or procedures arising out of or in any way connected with the performance of this agreement, Construction Manager may immediately take whatever action is deemed necessary by Owner and/or Construction Manager to remedy the claim or violation. Any and all costs or expenses paid or incurred by Owner and/or Construction Manager in taking such action shall be borne by the Contractor and may be deducted from any payments due Contractor.

B. The Contractor agrees to (1) take all necessary steps to promote safety and health on the job site; (2) cooperate with Owner and/or Construction Manager and other Contractors in preventing and eliminating safety and health hazards: (3) train, instruct and provide adequate supervision to ensure that its employees are aware of, and comply with, applicable Federal and State safety and health laws, standards, regulations and rules, safe healthful work practices and all applicable safety rules, regulations and work practices and procedures (4) not create any hazards or expose any of its employees, employees of the Owner and/or Construction Manager or employees of Contractors to any hazards; and (5) where the Contractor is aware of the existence of a hazard not within its control, notify the Construction Manager of the hazard as well as warn exposed persons to avoid the hazard.

C. The Contractor / Sub-contractor shall prepare a written Job Hazard Analysis (JHA) common to the construction industry for any work of a high risk nature. This JHA will be prepared and signed by each work crew each day prior to starting work on a specific area of work and any time a crew is re-assigned to a new work task. The JHA form is generally in table form and simply describes tasks to be performed, potential hazards and mitigating measures. The form is used to identify, analyze, understand and mitigate potential hazards associated with repetitive or potentially hazardous work operations. Each employee associated with the work to be performed shall be instructed by their companies designated Competent Person of the safety measures listed on the form and shall sign the document prior to the commencement of work. (examples of "high risk": pre-cast concrete, scaffold activities, steel erection, work at heights, work at depths, road work, etc.) If the contractor prepares a similar assessment form it must be reviewed to meet the criteria of a Job Hazard Analysis (JHA) as described by the U.S. Department of Labor (OSHA 3071 2002 Revised).

D. The Contractor's Superintendent or Safety Supervisor shall immediately, verbally report, and promptly thereafter confirm in writing to the Construction Manager any unsafe conditions or practices that are observed, or violations of job safety which are not within the Contractor's control.

E. Contractors shall immediately, verbally report, and promptly thereafter confirm in writing, to the Construction Manager any unsafe practices or conditions that are observed which are not under the Contractor's control.

F. The Contractor's Superintendent or Safety Supervisor shall ensure that adequate first aid supplies are available, and that personnel are qualified to administer first aid/CPR, as required by State and/or Federal regulations.

G. Every Contractor shall promptly notify Construction Manager of any personal injury requiring medical treatment of any of the Contractor's employees at the Project site; or of significant damage to property arising in connection with Contractor's performance, as promptly as possible after the occurrence of such injury or damage. Within twenty-four hours of such occurrence, Contractor shall furnish to Construction Manager a complete written report of such injury or damage.

H. Contractor certifies that the forgoing terms shall be made applicable to all Contractors' subcontractors, suppliers, materialmen, or anyone furnishing labor and/or materials to the site.

I. Every Contractor shall continue to educate their job Safety Supervisor or Superintendent of their responsibilities, which shall include:

1. Instructing workers and subcontractors under its supervision in safe work practices and work methods at the time they are given work assignments.

2. Ensuring that its workers and subcontractors have and use the proper protective equipment and suitable tools for the job.

3. Continuously checking to see that no unsafe practices or conditions are allowed to exist on any part of his job.

4. Acquainting its workers and subcontractors with all applicable safety requirements and ensuring that they are enforced.

5. Setting a good example for their workers.

6. Making a complete investigation of incidents to determine facts necessary to take corrective action.

7. Promptly completing an "Incident Investigation Form" with his Supervisor's assistance and distributing as required.

8. Holding weekly "tool box" safety meetings with their employees to:

   a. Discuss observed unsafe work practices or conditions including a review of current foreman meeting and progress meeting reports.

   b. Review each incident with their employees and discuss correction of incident root causes.

   c. Encourage safety suggestions from his men.

9. Seeing that prompt medical treatment is administered to an injured employee.

10. Correcting or reporting immediately to project superintendent any observed unsafe conditions, practices or violations of job safety or security.

11. Making all reports required by these Contract Documents to the Construction Manager in a full and timely fashion.

5. SAFETY MEETINGS

A. The Contractor's Project Manager or Superintendent shall attend weekly or biweekly supervisory job meetings. The first topic of these meetings will be job site safety. The weekly safety reports will be reviewed, and violations must be corrected immediately. Contractors will be encouraged to participate in the on-going jobsite safety.

6. TOOL BOX SAFETY MEETINGS

   A. The Contractor shall schedule weekly "tool box" safety sessions to be held by their project safety supervisor or competent person / superintendent for all their employees.

   B. A member of the Contractor's management staff shall periodically attend "tool box" safety sessions to evaluate their effectiveness and offer any appropriate suggestions for improvement.

7. REPORTS

   A. Contractors shall report all accidents or injuries on a timely basis in accordance with all applicable regulations.

   B. Contractors shall promptly complete an incident investigation report of all incidents.

   C. A record of all "tool box" safety sessions shall be made and submitted to the Construction Manager.

8. SAFETY REPRESENTATIVE

   A. The Construction Manager (CM) may employ the services of a Safety Representative on the project.

   B. The CM Safety Representative will visit the job site on a weekly basis, or as necessary, to determine if the work is being performed in a safe manner and in accordance with OSHA, State and Local safety regulations. The CM Safety Representative is not responsible for observing and documenting all possible safety violations. The Contractors' Safety Representatives, Safety Supervisors, or Superintendents shall attend job site safety inspections with the CM Safety Representative.

   C. The CM Safety Representative will prepare a written report at the end of each inspection listing the safety violations observed during the inspection. This report will be distributed to all Contractors. Contractors will immediately correct all safety violations and provide written documentation to the CM verifying that all hazards have been corrected.

9. RIGHT TO STOP THE WORK DUE TO SAFETY VIOLATIONS

   A. The Construction Manager, in its sole discretion, may order the Contractor to stop the work due to safety violations under the following circumstances:

      1. If the Construction Manager observes the Contractor is violating safety regulations and the Contractor takes no immediate action to correct the violation.

      2. If the Contractor has been notified by the Construction Manager in writing that he is in

violation of safety regulations and fails to take action to correct the violation within 24 hours of the notice.

B. If the Construction Manager directs the Contractor to stop the work due to safety violation, it will be done in accordance with the General Conditions of the Contract. Contractor shall not be permitted an adjustment of the Contract Time or Sum for the days lost to any suspension of work.

C. If the Construction Manager or Safety Representative observes Contractor's employee violating this safety program or OSHA Standards in a habitual manner, or creating a serious life safety violation, the Construction Manager or Safety Representative may instruct the Contractor's superintendent or foreman to remove the violator from the work site for failure to comply with the safety program and the contract.

10. EMERGENCY PROCEDURES

A. The Construction Manager shall establish a central meeting location for the assembly of all Contractors' employees in the event of a job site emergency.

B. Contractors shall assemble all their personnel and account for all employees. Contractors must immediately report to the Project Superintendent with the status of their employees.

11. FALL PROTECTION PROCEDURES

A. Contractors are responsible, in accordance with federal, state, local laws and regulations including OSHA. to provide and enforce their own site specific fall protection program and equipment. The following fall protection procedures shall be enforced by all Contractors as a minimum standard.

1. All workers on walking/working surfaces with unprotected sides or edges six feet (6') or higher above the next lower level must be protected from falls by the use of guardrail systems, net systems, fall arrest systems or control access zone programs. It is intended that when fall protection is required, it is required 100% of the time. All contractors are reminded that relevant industry regulations require that contractors comply with the following standards.

a. Workers constructing or working near leading edges must be protected.

b. Workers on the face of formwork or reinforcing steel must be protected at a height of 6 feet (6') or greater.

c. Employees working from scaffolds shall be guarded / protected from falling 6 feet (6') above next lower level.

d. Brick layers performing overhand bricklaying and related work six feet (6') or higher above

lower levels must be protected from falls.

e. Roofers must comply with OSHA regulations for roof work.

f. The Contractor's controlled access zone plan shall be included in their site-specific safety program and shall be submitted prior to the start of work. Contractors are responsible for assuring programs are OSHA compliant.

g. Guidelines for Residential Construction or any interpretations will not be accepted in lieu of 1926 Standards.

h. Contractors must provide certification per OSHA CFR29 § 1926.503(b) of employee training and retraining on fall protection upon request.

B. Contractor shall provide their own fall protection. Fall protection may be provided by guardrail systems, net systems, or personal fall arrest systems. All fall protection systems must comply with OSHA regulations.

C. Stepladders, exposed to shafts or edges of the building, greater than six feet (6') above the next lower level, must be tied off or otherwise secured. Employee must wear fall protection, i.e., harness/lanyard.

D. The Safety Cable System shall not be altered or removed without a written request submitted to the Project Manager with a copy to the Superintendent. It shall be the responsibility of each Contractor that is removing or altering the Safety Cable System to maintain the fall protection safety provided by the safety cable and not leave the area unprotected. Each Contractor shall be responsible to re-install the Safety Cable System immediately after work is completed. Each Contractor shall be responsible to re-install the Safety Cable System in accordance with OSHA regulations.

E. Fall protection will be enforced for Structural Steel Erectors.

1. Contractors engaged in structural steel erection are specifically advised that structural steel erectors shall comply with all protection requirements for all work at a height of six feet (6') or greater above the next lower level, 100 percent of the time, by any of the following means.

a. Standard guardrail system.

b. Personal Fall Arrest System (PFAS) – full body harness with shock absorbing lanyard. PFAS must meet the requirements of CFR 1926 subpart M.

c. Access to work area shall be provided by ladders or other safe methods. There shall be

sufficient number of ladders, or other safe methods, available to reduce the amount of "beam walking." When it is absolutely necessary to traverse a beam, 100% fall protection must be utilized.

d. Steel erection Contractors must, at all times, be able to certify in writing that each of their employees have been properly trained in both OSHA fall protection standards and the Contractor's site specific project fall protection procedures.

e. Prior to the erection of the steel, the Contractor shall meet with the Project Manager and Safety Representatives to review and document site specific procedures.

12. AIRBORNE CONTAMINENTS PROCEDURES

A. Contractors must provide and use equipment furnished with Exhaust Purifiers / Scrubbers when any equipment produces airborne containments and will be used in an enclosed building.

B. The Contractor shall verify air quality by the use of air monitoring equipment and document such verified air quality on the daily report. The monitoring equipment shall, at a minimum, be designed with an auditory alarm and shall provide continuous monitoring of these four gases: Oxygen, Hydrogen Sulfide, Carbon Monoxide and Combustible gases.

C. The Contractor must provide administrative or engineering controls to protect its workers from exposure to occupational health, environmental or other hazards to be implemented whenever feasible. When such controls are not feasible to achieve full compliance, protective equipment or other protective measures shall be used to keep the exposure of employees to air contaminants within the limits prescribed by local, state, and federal regulations. Any equipment and technical measures used for this purpose must first be approved for each particular use by a competent industrial hygienist or other technically qualified person. Whenever respirators are used, their use shall comply with 1926.103.

13. CELL PHONE AND RADIO USE POLICY

A. Use of cell phones on EDiS Company projects should be limited to non-construction type activity areas and away from active construction areas (i.e., project office). This includes both cell phone use and the review of data, information, texts, and the internet. Except in an emergency circumstance, phones should only be used in the designated areas. Anyone observed using a cell phone outside of these designated areas without regard to maintaining a safe focus on their surroundings can be subject to discipline, up to and including removal from the project. Use of ear buds, ear phones, and portable radios are absolutely prohibited on EDiS Company project sites. Anyone using ear buds, ear phones, or any other device that would prevent the wearer from receiving auditory cues about the surrounding environment will be subject to discipline, up to and including removal from the project.

14. EXCAVATION PROCEDURES

A. Before ANY excavation work is to commence, the Contractor/Excavator shall contact the utility companies or utility owners and advise them of the proposed work and ask them to mark the location of the underground utility installations. This notification shall be done within established or customary local response times. If the work is on private property and the utility company will not mark out the utilities, the Contractor/Excavator will hire a private locating service to mark the utilities. Once the utilities are located and marked, the Contractor/Excavator will excavate by hand or use a vacuum truck to expose the utilities and record the exact location and elevation of the utilities.

B. The Contractor/Excavator must submit the Excavation Permit to EDiS Company verifying their assurance of communication with the utility companies or utility owners. The Contractor/Excavator must follow State, Local, and Federal Guidelines prior to proceeding with excavations. The Contractor/Excavator will have these marks restored as long as there is work to perform.

C. Once the Contractor has installed new utilities, they will provide to EDiS Company an as-built drawing, within 7 days, showing the exact location and elevation of the utilities. The installing Contractor will be responsible for locating and marking these utilities for other contractors that may have work in the same area.

D. Definition: "Excavator" shall mean any person, including those acting either as an employer or employee, intending to perform or performing excavation or demolition work.

E. Definition: "Excavate" or "Excavation" shall mean any operation in which earth, rock or other material in the ground is moved, removed, or otherwise displaced or disturbed by means of any tools, equipment or explosives and includes, without limitation, grading, trenching, digging, dredging, ditching, drilling, auguring, tunneling, boring, backfilling, post pounding, driving objects into the ground, installation of form pins, hammering, scraping, cable or pipe plowing or driving.

15. TRAFFIC CONTROL PROCEDURES: Manual on Uniform Traffic Control Devices (MUTCD)

A. Traffic control plan(s) for the work may be required by the Authorities Having Jurisdiction (AHJ). Traffic control plans, if required, shall be prepared per AHJ standards, at the Contractor's expense, for review and approval by the AHJ. (Note: anything on a public right of way controlled by the state will require an engineer's stamp.) The implementation of the traffic control plan and any associated maintenance shall be performed at the Contractor's expense in accordance with the requirements of the AHJ. All warning signs and safety devices used by the Contractor to perform the work shall conform to the requirements contained in the State where the work is being performed, and the Department of Transportation's current edition of "Manual on Uniform

Traffic Control Devices". The Contractor shall also be responsible for all traffic control required by the AHJ over the Project on the intersecting streets.

B. Contractors must submit a traffic control plan to the AHJ over the project for approval within fourteen (14) calendar days of Contract award. The approved traffic plan must be submitted prior to the commencement of work in a public street. The Contractor's representative on the site responsible for traffic control shall produce evidence that he/she has completed training acceptable to the Department of Transportation for safety through construction zones. All of the streets in which the work will occur shall remain open to traffic and one lane of traffic maintained at all times unless otherwise directed by the AHJ. Businesses and residences adjacent to the work shall be notified forty- eight (48) hours in advance of closing of streets, roadways, driveways, etc. The Contractor shall make every effort to minimize the amount of public parking temporarily eliminated due to construction in areas fronting businesses. No stockpiles of pipe or other material will be allowed in traveled right-of- ways unless otherwise approved. These requirements shall not authorize any extension of time for performance of this Contract.

16. SCAFFOLDING PROCEDURES

A. A written project specific scaffold inspection checklist must be completed by the Contractor's competent person responsible for inspecting the scaffolding before each work shift, and after any occurrence which could affect a scaffold's structural integrity. A copy of the documented scaffold inspection checklist must be maintained by each company performing work on a scaffold and a second copy provided for record to the EDiS project office.

B. Contractors are required to ensure that all employees working on or around scaffolding are properly trained. Contractors shall provide documented verification of scaffold training upon request.

C. Scaffold erectors and dismantlers are required to wear fall protection during the erecting, modifying and dismantling scaffolds. In cases where fall protection is infeasible or creates a greater hazard, the competent person shall document their decision at each specific location of scaffold assembly. At minimum, the scaffold erectors and dismantlers shall wear a fall protection harness during the erection, modification and dismantling of scaffolds.

D. Contractors shall utilize a scaffold tag system. The scaffold tag system shall be color coded and visible. The competent person shall sign and date the scaffold tag.

1. Green tags are reserved for complete systems.
2. Red tags are reserved for erection/dismantling activities and for scaffolds with deficiencies in the system.

3. Yellow tags are reserved for systems that require the use of both PFAS and guardrail systems for incomplete scaffold systems or platforms.

END OF SECTION

CONTRACTOR

COMPETENT / QUALIFIED PERSON DESIGNATION LOG

Project: CSD - Leach School **Field Manager:**

Contract: Contractor:	Applicable to Subcontractor (yes / no)		Foreman	Competent Person (if not foreman)
Subpart C-General Provisions				
1926-20 General Safety				
Subpart D - Health and Environmental Controls				
1926-53 Ionizing Radiation				
1926-55 Gases, Vapors, Fumes, Dusts, Mists				
1926-57 Ventilation				
1926.59 Hazard Communication				
1926.62 Lead				
Subpart E - Personal Protective Equipment				
1926.101 Hearing				
1926.103 Respirator Protection				
Subpart H - Materials Handling, Storage				
1926.251 Rigging Equipment for Material Handling				
Subpart J - Welding and Cutting				
1926.354 Welding, Cutting and Heating				
Subpart K - Electrical				
1926.404 Wiring Design and Protection				
Subpart L - Scaffolding				
1926.451 Scaffolding				
Subpart M - Fall Protection				
1926.502 Fall Protection Criteria and Practices				
1926.503 Training				
Subpart N - Cranes, Derrick -Redesignated 1926.1501				
Subpart O - Motor Vehicles and Equipment				
1926.601 Motor Vehicles				
Subpart P - Excavations				
1926.651 Specific Excavation Requirements				
1926.652 Requirements to Protective Systems				
Subpart S - Tunnels, Shafts, Caissons				
1926.800 Tunnels, Shafts, Caissons				
1926.803 Compressed Air				
Subpart T - Demolition				
1926.850 Preparatory Operations				
1926.852 Chutes				
1926.859 Mechanical Demolition				
Subpart V - Power Transmission and Distribution				
1926.955 Overhead Lines				

Contract: Contractor:	Applicable to Subcontractor (yes / no)		Foreman	Competent Person (if not foreman)
Subpart X - Stairways and Ladders				
1926.1053 Ladders				
1926.1060 Training Requirements				
Subpart Z - Toxic and Hazardous Substances				
1926.1101 Asbestos				
1926.1101 thru 1926.1148 Toxic and Hazardous Substances				

I certify that the listed employees are competent persons, as defined and required by specific OSHA standards. They are capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Name (print)

Contractor Signature

Date

PU19, Revised 07/2021

Certification of Training Documents to be Submitted with Safety Policy/Program

Provide a certification of training for employees on your safety program.

Certification of training must include: Employee's name, date of training, person conducting the training, topics covered, and a statement that the student has successfully completed the course.

In addition, Contractor shall provide certification of training on the following programs, as they pertain to your contract and project tasks. This list is not meant to be all inclusive: please refer to OSHA regulations for applicable safety requirements.

a. ☐ Scaffold: 1926.454

b. ☐ Fall Protection 1926.503

c. ☐ Crane Operator: 1926.1427

d. ☐ Signal person (this is for any persons connecting material or equipment for lifting): 1926.1428

e. ☐ Crane maintenance: 1926.1429

f. ☐ Steel erection fall protection: 1926.761

g. ☐ Respiratory protection (medical clearance and training records complying with 1910.134

h. ☐ Powder-actuated tools: 1926.302

i. ☐ Motor Vehicles (are those vehicles that operate within an off-highway jobsite, not open to public traffic): 1926.21

Work Area:		**JOB HAZARD/RISK ANALYSIS**
Site:	CSD Leach School	
Company:		

Describe Activity:		**Date:**	
Completed By:			

Work Process and Tasks *Describe the tasks / steps involved*	**Hazards Identified for each Task / Step**	**Risk Level** *High – Medium*	**Control / Safe Work Procedures for each Task** *Controls to be implemented (consider the hierarchy of hazard controls)*

Checklist for Guidance		
• Does Task effect other trades?	• Any overhead and / or underground utilities?	• What type of PPE will be used?
• Any Fall Conditions greater than 6 feet?	• What are the potential “hazards”?	• How can the “hazard” be eliminated?
• Have employees been trained in the assignment? (e.g. fall protection, scaffold, excavation, etc..)	• What “hazards” are present?	• Excavation Safety System to be used?

Competent Person / Supervisors Comments	**Date:**	
Employee Name:	**Competent Person Signature:**	

Work Area:		**JOB HAZARD/RISK ANALYSIS**
Site:	CSD Leach School	
Company:		

SECTION 01 42 16
DEFINITIONS

PART 1 GENERAL

1.01 SUMMARY

A. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

A. Furnish: To supply, deliver, unload, and inspect for damage.

B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.

C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

D. Project Manual: The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.

E. Provide: To furnish and install.

F. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 43 39
MOCKUP REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes general requirements for constructing field mock-ups. Refer to technical sections for more product-specific mock-up requirements.

B. Requirements for mock ups are supplemental to requirements for samples and field samples as specified in individual technical sections.

1.02 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division of Specifications sections apply to this section.

B. Refer to individual specification sections for required mock-ups.

1.03 SUBMITTALS

A. Submit in accordance with Section 01 30 00 - Submittal Procedures all required submittals.

B. Mock-up Plan: Copy of proposed locations for each mock-up.

1.04 DEFINITIONS

A. Mock ups: Full-size, physical example assemblies, constructed on-site, to illustrate finishes and materials. Mock ups are used to:
   1. Verify selections made under Sample submittals;
   2. Demonstrate aesthetic effects and, where indicated, qualities of materials and execution;
   3. Review construction, coordination, testing or operation;
   4. Show interference between dissimilar materials; and
   5. Demonstrate compliance with specified installation tolerances.

1.05 QUALITY ASSURANCE

A. Mockup Plan: Detailed, dimensioned plans and elevations showing mockup size, and items and materials that will be included in proposed mockup.

B. Pre-Construction Conference: Prior to the construction of the mockups, a conference shall be scheduled by the Construction Manager for the purpose of reviewing the requirements and intent of mockups. The conference shall be attended by the Construction Manager, Owner, Contractor, and person supervising this phase of the Work

C. Mock-ups to be constructed independantly of building construction. After all construction and punchlist is complete, the mock-ups shall be removed as indicated by the Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 INSTALLATION

A. Before installing portions of the Work requiring mock ups, build mock-ups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed work:
   1. Build mock ups in location and of full scale size and profile indicated, or as directed by the Architect.
   2. Mock-up shall include all elements of the exterior wall, demonstrating surface and material changes from the ground to the roof cornice/coping trim.
   3. Demonstrate the proposed range of aesthetic effects and workmanship.
   4. Employ supervisory personal to oversee mock up construction. Employ same workers that will be employed during the construction of the Project.
   5. Notify the Owner a minimum of fourteen (14) working days advance notice of dates and times when mock ups will be constructed and able to be inspected.

6. Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
7. Allow five (5) working days for Owner's initial review and re-review of each mock up.
8. Do not complete production of materials for final Project site until Owner's review of mock up has been obtained.
9. The mockup will establish the standard of quality of workmanship by which the Work will be judged.

B. Mockup Type: Construct mockup in accordance with approved shop drawings, project manual, and constract documents using exact materials and methods approved for the Project, including required accessories. See also drawings and individual material specification sections for Mock-up requirements

C. Mock-up approval: The construction of several mock ups is required for the Architect/Engineer and Owner review and approval as part of this contract.
1. Mock-ups will be used to make final material selection, evaluate installation techniques, and evaluate compatibility of selected components. The completed mock ups will serve as a mutual understanding of the workmanship and methods to be used on actual installation.
2.
3. Unless otherwise indicated, accepted mock ups establish the standard by which the Work sill be judged.

D. Commence ordering of materials after mockup has been inspected and approved in writing by the Owner and Architect.

E. Where mock up is rejected, replace, rebuild and/or modify mock up as directed by the Owner.

F. Maintain mock ups during construction in an undisturbed condition as a standard of judging the completed Work.

END OF SECTION

SECTION 014500 - QUALITY CONTROL

1. DESCRIPTION

   A. Quality control services include inspections and tests performed by independent agencies and governing authorities, as well as by the Contractor. Inspection and testing services are intended to determine compliance of the work with requirements specified. Specific quality control requirements are specified in individual specification sections.

2. RESPONSIBILITIES

   A. Contractor Responsibilities: Except where indicated as being the Owner's responsibility, quality control services are the Contractor's responsibility, including those specified to be performed by an independent agency and not by the Contractor. The Contractor shall employ and pay an independent agency, testing laboratory or other qualified firm to perform quality control services specified.

      1. The Owner will engage and pay for services of an independent agency to perform the inspections and tests that are specified as Owner's responsibilities.

   B. Retest Responsibility: Where results of inspections or test do not indicate compliance with Contract Documents, retests are the Contractor's responsibility.

   C. Responsibility for Associated Services: The Contractor shall cooperate with independent agencies performing inspections or test. Provide auxiliary services as are reasonable. Auxiliary services include:

      1. Provide access to the Work.

      2. Assist taking samples.

      3. Deliver samples to test laboratory.

   D. Coordination: The Contractor and independent test agency shall coordinate the sequence of their activities and shall avoid removing and replacing work to accommodate inspections and test. The Contractor is responsible for scheduling time for inspections and tests.

   E. Qualifications for Service Agencies: Contractor shall engage only inspection and test service agencies which are pre-qualified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories.

   F. Submittals: Contractor shall submit a certified written report of each test, Inspection or similar service, in duplicate to the Construction Manager. Contractor shall submit additional copies of each report to any governing authority, when the authority so directs.

   G. Report Data: Written inspection or test reports shall include:

1. Name of testing agency or test laboratory.

2. Dates and locations of samples, tests or inspections.

3. Names of individual present.

4. Complete inspection of test data.

5. Test results.

6. Interpretations.

7. Recommendations.

H. Repair and Protection: Upon completion of inspection or testing, Contractor shall repair damaged work and restore substrates and finishes. Contractor shall comply with requirements for "Cutting and Patching."

I. Special Instructions:

1. Structural tests and special inspections must be conducted by an approved agency (an agency or firm regularly engaged in conducting tests or furnishing inspection services, approved by the authority having jurisdiction.) This means that contractors will no longer be allowed to cast their own test cylinders for example.

2. Continuous special inspection (the full-time observation of work by an approved special inspector who is present until completion of the work) is required for any steel welds and connections. Critical elements may include: all slip critical bolted connections, complete and partial groove welds, multi-pass fillet welds and single pass fillet welds greater than 5/16".

3. Continuous special inspection is required during the placement of all concrete and shotcrete for the proper application techniques with a few exceptions.

4. Periodic special inspection (the part-time observation by an approved special inspector) is required for any steel welds and connections. Critical elements may include: all slip critical bolted connections, complete and partial groove welds, multi-pass fillet welds and single pass fillet welds greater than 5/16".

5. Spray applied fireproofing requires periodic special inspection for the structural member surface conditions, application, thickness, density and bond strength.

6. Based on the classification, occupancy, and design of the structure, the code requires periodic special inspection for placement of masonry units and reinforcing steel and continuous special inspection of grout placement.

END OF SECTION

SECTION 015113 - TEMPORARY ELECTRICITY

1. GENERAL

A. RELATED WORK SPECIFIED ELSEWHERE

1. Electrical Basic Materials and Methods, Division 16 or 26.

B. DESCRIPTION OF SYSTEM

1. Power Source

a. Suppliers: Delmarva Power

b. The Electrical Contractor shall provide 277/480 volt, three phase, 60 cycle power service to the site utilizing the existing S&C Switch and Electric Manhole.

c. The Electrical Contractor will make all arrangements for bringing the power supply to the site and for installation of appropriate temporary transformers to provide for the power supply in 1.B.1.b, above.

d. The source will be adequate to service temporary electrical needs of the proposed construction.

2. Electrical Service

a. The electrical subcontractor will bring a source of temporary power to the building pad following construction of the building foundations and slabs. Each subcontractor is responsible for providing their own temporary power source and associated fuel until the temporary service is installed.

b. Contractor will be responsible to pay for all costs associated with providing electrical service from the power source to their respective site office, temporary storage facilities or temporary construction buildings as appropriate.

c. Prior to issuance of the Notice to Proceed for the electrical contract, the Construction Manager will be responsible for providing temporary electrical service as provided in 1.B.2.c, below. After issuance of the Notice to Proceed for the electrical contract, the Electrical Contractor shall become responsible for maintaining all electrical power supply and service facilities installed by the Construction Manager. The Electrical Contractor shall also, from that date forward, be responsible for providing and maintaining temporary electrical service to the site as provided in 1.B.2.c, below.

d. The Electrical Contractor, as provided in 1.B.2.b, above, shall install temporary electric service for items below, throughout the construction period, such that power can be secured at any desired point with no more than a 60 foot extension:

(1) Power Centers for miscellaneous tools and equipment used in the construction work shall be provided with a minimum of four 20-amp, 120 volt grounding type outlets. Each outlet shall be provided with ground fault detecting circuit breaker protection. The distance between each receptacle location shall not exceed 50 feet.

(2) Construction areas, ramps, runways, corridors, offices, shops, and storage areas shall be lighted to not less than the minimum illumination intensities at five (5) foot candles and any additional OSHA requirements. Adequate lighting for safe working conditions and the exterior of the structure shall be provided and maintained on a 24 hour per day basis throughout the building. Voltage of each lighting component must be able to accommodate lighting requirements.

(3) Temporary Exterior lighting shall be provided and maintained on a 24 hour per day basis. Exterior lighting is to be located at each exterior entrance to the building (stairtowers, main entrance, rear entrance).

(4) Power for testing and checking equipment must be supplied.

3. Capacity

a. All electrical power supply and service lines installed shall be of adequate capacity for construction use by all trades during the construction period at the locations necessary.

b. The Electrical Contractor shall notify the Power Company if unusually heavy loads, such as welding units, are anticipated.

4. Power Costs

a. The Construction Manager will pay all costs of temporary electrical power used during construction.

b. The Owner will pay all costs of power used in the permanent wiring.

C. REQUIREMENTS AND REGULATORY AGENCIES

1. The Electrical Contractor will obtain permits as required by local governmental authorities.

2. The temporary electrical service shall comply with National Electrical Code, 1990 Edition and applicable local codes and utility regulations.

D. USE OF PERMANENT SYSTEM

1. The Electrical Contractor shall regulate any part of the permanent electrical system which is used for construction purposes to prevent interference with safety and orderly progress of

the Work.

2. Contractors shall leave permanent electrical services in a condition as good as new and clean.

2. PRODUCTS

A. MATERIALS

1. General

a. The materials may be new or used, but must be adequate in capacity for the purposes intended and must not create unsafe conditions or violate the requirements of applicable codes.

2. Conductors

a. Use wire, cable, or busses of appropriate type, sized in accordance with the National Electrical Code for the applied loads.

b. Use only UL labeled wire and devices.

B. EQUIPMENT

1. Provide appropriate enclosure for the environment in which used in compliance with NEMA standards.

3. EXECUTION

A. GENERAL

1. Install all work with a neat and orderly appearance.

2. Make structurally sound throughout.

3. Maintain to give continuous service and to provide safe working conditions.

4. Modify temporary power and light installation as job progress requires.

B. INSTALLATION

1. Locate so that interference with storage areas, traffic areas and work under other Contracts is avoided.

C. REMOVAL

1. Remove all temporary equipment and materials completely upon completion of construction.

2. Repair all damage caused by the installation and restore to satisfactory condition.

END OF SECTION

SECTION 015123 - TEMPORARY HEATING, COOLING AND VENTILATING

1. GENERAL

A. RELATED REQUIREMENTS SPECIFIED ELSEWHERE

1. Temporary Electric: Section 015113

2. Temporary Facilities: Section 015200

3. Heating Requirements for Cold Weather Installation and Protection of Materials: Respective specification section for each item of work.

B. DEFINITIONS

1. Temporary Enclosures: Sufficient preliminary enclosures of an area of structure, or of an entire building, to prevent entrance or infiltration of rainwater, wind, or other elements and which will prevent undue heat loss from within enclosed area.

2. Permanent Enclosure: Stage of construction at which all moisture and weather protection elements of construction have been installed in accordance with Contract Documents, either for a portion of structure, or for an entire building.

C. DESCRIPTION OF SYSTEM

1. Prior to the building or portion of building being permanently enclosed, each Contractor shall provide temporary heat and ventilation and weather protection necessary for their work, as described below. After permanent enclosure, the Mechanical Contractor provide and maintain temporary heat and ventilation in enclosed areas, coordinated by the Construction Manager, required to:

a. Facilitate progress of Work.

b. Protect Work and products against dampness and cold.

c. Prevent moisture condensation on surfaces.

d. Provide suitable ambient temperatures and humidity levels for installation and curing of materials.
e. Provide adequate ventilation to meet health regulations for safe working environment.

2. Temperatures Required

a. Generally, 24 hours a day: Minimum of 40 degrees F.

b. 24 hours a day during placing, setting, and curing of cementitious materials: As required by specification section for each product.

c. 24 hours a day, seven days prior to, and during, placing of interior finishes: woodwork, resilient floors, painting and finishing: As required by specification section for each product.

d. 24 hours a day after application of finishes, and until Substantial Completion: Minimum of 50 degrees F.

3. Ventilation Required:

a. Contractors shall prevent hazardous accumulations of dusts, fumes, mists, vapors, or gases in areas occupied during construction. Reference OSHA regulations CFR 1926.55 (Gases, vapors, fumes, dusts, and mists). and CFR 1926.57 (Ventilation).

(1) Provide local exhaust ventilation to prevent harmful dispersal of hazardous substances into atmosphere of occupied areas.

(2) Dispose of exhaust materials in manner that will not result in harmful dispersal of hazardous substances into atmosphere of occupied areas.

(3) Continuously ventilate storage spaces containing hazardous or volatile materials.

(4) Contractor/subcontractor must provide and use equipment which is furnished with Exhaust Purifiers/Scrubbers or is electrically power driven when any such equipment produces airborne containments and will be used in an enclosed building.

(5) The Contractor/subcontractor shall verify air quality by the use of air monitoring equipment and document the verified air quality on the daily report. The monitoring equipment shall, at a minimum, be designed with an auditory alarm and shall provide continuous monitoring of those four gasses, Oxygen, Hydrogen Sulfide, Carbon Monoxide and Combustible gasses.

4. Contractors shall provide adequate ventilation for:

a. Curing installed materials.

b. Dispersal of humidity.

c. Temporary sanitary facilities.

5. Duration of Operations:

   a. For Personnel:

      (1) At all times personnel occupy an area subject to hazardous accumulations of harmful elements.

      (2) Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful elements.

   b. For curing installed materials: As required by specification section for respective materials.

   c. For humidity dispersal: Continuously ventilate to provide suitable ambient conditions for work.

   d. The Mechanical Contractor shall maintain supervision and operation of temporary heating and ventilating equipment in order to:

      (1) Enforce conformance with applicable codes and standards.

      (2) Enforce safe practices.

      (3) Prevent abuse of services.

D. COSTS OF INSTALLATION AND OPERATION

1. The Contractor shall be responsible for all installation and operating costs for any heat and ventilation as required in this section until the permanent HVAC system is in operation.

2. After the permanent HVAC system is operational, the Owner will pay the costs of fuel for temporary heat and ventilation. The Contractor will pay the costs for maintaining the system until final acceptance by the Owner.

3. The Mechanical Contractor shall be responsible for all installation and operating costs for any heat required to supplement that which is to be supplied by the Construction Manager in paragraph 1.C.1, above.

E. REQUIREMENTS OF REGULATORY AGENCIES

1. The Construction Manager will obtain and pay for permits as required by governing authorities for those activities required by this Section.

2. Contractor shall comply with Federal, State, and local codes, and utility company regulations.

2. PRODUCTS

A. MATERIALS

1. General

a. Materials may be new or used but must be adequate for purposes intended and must not create unsafe conditions nor violate requirements of applicable codes.

B. EQUIPMENT

1. Standard products, meeting code requirements.

2. Provide required facilities, including piping, wiring and controls.

3. Portable Heaters:

a. Indirect hot air units, located outside with duct entering into the building. Provide a sufficient number of units to meet the temperature and ventilation requirements specified above.

b. Provide Safety Controls against explosion, overheating, and carbon monoxide build up.

c. Provide adequate combustion air.

d. Provide Temperature Controls installed in the building at a location(s) designated by the Construction Manager.

e. Provide temporary barricades around the equipment to protect against damage from other construction equipment.

f. Provide supplementary fans / distribution equipment capable of distributing heated air evenly throughout the space(s).

4. Oil-Fired heaters will not be allowed.

3. EXECUTION

A. GENERAL

1. Comply with applicable sections of Division 26 - Mechanical.
2. Install work in neat and orderly manner.
3. Make structurally, mechanically, and electrically sound throughout.
4. Maintain to give safe, continuous service at required times and to provide safe working conditions.
5. Modify and extend system as work progress requires.

B. INSTALLATION

1. Locate units to provide equitable distribution of heat and air movements.
2. Locate to avoid interference with, or hazards to:
   a. Work or movement of personnel.
   b. Traffic areas.
   c. Materials handling.
   d. Storage areas.
   e. Work of other Contractors.
   f. Finishes.

C. OPERATION OF PERMANENT EQUIPMENT

1. The Construction Manager will coordinate with the mechanical Contractor.
2. The Mechanical Contractor will place permanent HVAC system in operation only upon written authorization by the Construction Manager.
3. Before operating the permanent HVAC equipment, the Contractor shall confirm to the Construction Manager that:
   a. Inspection has been made by proper authorities.
   b. Systems, equipment piping, strainers, filters and associated operating items are sufficiently complete, cleaned, and ready for operation.

c. Controls and safety devices are complete and tested, or adequate temporary controls are provided.

d. Before operating the permanent HVAC equipment, the Contractor shall install temporary filters:

(1) For air handling units.

(2) For permanent ducts.

(3) The mechanical contractor will include monthly changes of the temporary filters for a minimum of six (6) months.

D. REMOVAL

1. The Contractor shall completely remove temporary materials and equipment when no longer required, or on completion of construction.

2. The Contractor shall clean and repair damage caused by temporary installation and restore equipment to specified or original condition.

3. The Contractor shall remove temporary filters and install new filters, or clean permanent filters, in the permanent HVAC system prior to final acceptance by the Owner.

END OF SECTION

SECTION 015200 - CONSTRUCTION FACILITIES & TEMPORARY CONTROLS

1. GENERAL

A. DESCRIPTION

1. Construction Manager and Contractors shall provide all temporary facilities throughout the construction period unless otherwise indicated in the Contract Documents.

2. Construction Manager and Contractors shall pay all costs for providing, maintaining and removing of all temporary facilities unless otherwise indicated in the Contract Documents.

B. RELATED WORK SPECIFIED ELSEWHERE

1. Temporary Electric: Section 015113.

2. FACILITIES

A. TEMPORARY SANITATION FACILITIES

1. Construction Manager will provide and maintain sanitary facilities for all personnel on the project.

2. The number of sanitary facilities required shall be based on the total number or workers employed on the site and shall be in accordance with the provisions of the applicable code.

3. Construction Manager will maintain sanitary facilities in a sanitary and clean condition at all times.

B. TEMPORARY WATER

1. Drinking Water: Contractor shall provide potable water for drinking purposes for all his personnel on the site. He shall furnish disposable drinking cups at water stations. Each water station shall be equipped with a suitable trash container for disposal of the drinking cups.

2. Construction Water: Construction Manager will provide and maintain tap locations for construction water of sufficiently pure and potable quality to avoid deleterious effect on any materials used. Location of construction water tap locations will be determined by the Construction Manager depending on the stage of construction of the incoming water service. Contractor shall provide and maintain all hoses, piping and valves as required for obtaining construction water from taps provided by the Construction Manager.

C. TEMPORARY TELEPHONES

1. Construction Manager will not provide any telephones or fax machines for Contractor's personnel. Each Contractor is responsible for its own phones and fax machines.

D. FIELD OFFICE

1. During the period of the Work and until final acceptance of the project, the Construction Manager will provide a weatherproof building for the Construction Manager's Field Project Manager(s) and Superintendent(s). Contractor shall make provisions for its own field office, subject to approval by the Construction Manager.

E. FIRE PROTECTION

1. The Carpentry Contractor will provide and maintain portable fire extinguishers on each floor level and building area. Number to conform to applicable codes.

2. Contractor shall provide additional fire extinguishers as required by OSHA regulations for its work.

3. Fire extinguishers shall be 10lb, Multi-Purpose (ABC) dry chemical, UL labeled, with a rating of 3a:40bc.

F. ACCESS ROADS AND PARKING AREAS

1. The Sitework Contractor will provide and maintain access roads on the site.

2. Neither the Construction Manager nor the Owner will provide parking for Contractor's personnel on or about the project site. All parking provisions required for Contractors will be solely the responsibility of the Contractors or their personnel.

G. STORAGE AREAS

1. The Construction Manager will assign storage areas on the site. Storage areas are extremely limited and will be assigned in a manner which will best facilitate the work.

2. Contractors shall provide all other storage space required for its work at off-site locations.

3. All combustible or flammable materials must be safely stored in a secured area in strict accordance with regulations, codes and laws enforced by local, State or Federal agencies, whichsoever is the most stringent.

H. FIRST AID STATION

1. The Contractor's Superintendent or Safety Supervisor shall insure that adequate first aid

supplies are available, and that personnel are qualified to administer first aid/CPR, as required by State and/or Federal regulations.

I. SECURITY

1. The Construction Manager will provide the following security measures at the site: security lighting will be provided by the electrical contractor..

2. All other safety and security measures shall be the responsibility of each Contractor. These measures shall include but are not limited to the provision of secured storage for tools, construction equipment, and materials and equipment scheduled for installation in the building.

J. BENCH MARKS AND BASELINE

1. The Construction Manager will lay out and establish and maintain bench marks and baselines.

2. The Contractor shall lay out his own work and shall be responsible for the accuracy of same.

3. Contractor shall check grades, lines, levels and dimensions as shown on the drawings and shall promptly report errors or inconsistencies in same to the Construction Manager before Work proceeds.

4. The Contractor is responsible for damaging or altering the bench marks and baselines established by the Construction Manager and shall bear the costs of replacing same.

K. FIELD OFFICE AND STORAGE TRAILERS

1. Each Contractor shall provide and maintain its own field office and storage trailers as required.

2. Each Contractor shall provide temporary heat and power for its field office and storage trailer.

3. Each Contractor's field offices and storage trailers shall be located as directed by the Construction Manager.

L. PROJECT SIGN

M. TRASH DISPOSAL

1. Each Contractor shall be responsible for daily clean up and depositing its common trash in the dumpsters provided by the Construction Manager.

2. The Construction Manager will not provide a trash chute.

3. The Construction Manager will provide dumpsters, and will arrange for disposal of common, non-hazardous, work-related trash deposited in these dumpsters. The masonry contractor will be responsible for providing their own dumpsters.

N. HOISTING

1. Contractor shall provide its own materials hoists and cranes. No personnel hoist will be provided.

O. SCAFFOLDING AND WORKING PLATFORMS

1. No scaffolding shall be provided by the Construction Manager. Each Contractor shall provide all scaffolding required to perform its Work.

P. SAFETY BARRICADES AND RAILINGS

1. The Structural Contractor shall provide barricades **and protective barriers** around elevator, stair, shaft and cut openings in floors and roofs, and edges of floors and roofs. The methods and materials used in barricading shall be in accordance with OSHA and local code regulations. Barricades and protective barriers will be installed immediately after the installation of the floor slab on any level or part of a level on the Building. Until a level has been fully barricaded, the Structural Contractor will be responsible for maintenance of the barricades. When a warning barricade is used to prohibit employees from entering a restricted work area. The "warning barricade" shall meet the requirements of CFR 1926.502 (f)(2). The supported rope, wire, or chain shall be flagged at not more than 6-foot (1.8 m) intervals with high-visibility material and maintain between 34 and 39 inches above the walking/working surface; Warning signs and tags shall be used in accordance with Subpart G of CFR OSHA Construction Industry Regulations.

2. After the barricades and protective barriers are no longer needed, the Structural Contractor will remove the barricades from the site. The Construction Manager will determine the location and scheduling of barriers to be removed.

3. Contractor shall provide for its own barricades at all other trenches, excavations, and locations not specifically identified in Paragraph 1 above.

4. Contractors who remove barricades shall be responsible for replacing them. If, after proper notification, in writing, from the Construction Manager the responsible Contractor does not correct his deficiencies in safety barricade placement, the Construction Manager reserves the right to undertake this work and backcharge the responsible Contractor(s).

5. During the execution of his work, Contractor will provide daily maintenance of, and

upon completion of same, restore all barricades in a manner acceptable to prevailing safety standards enforced by local, State or Federal ordinance, whichsoever is most stringent. The intent is to leave no floor penetration or perimeter opening in an unsafe condition.

6. The Construction Manager shall arrange for temporary ladders required for access to each of the floor levels after the completion of floor slab work, and until the final stairs are ready for use.

Q. PUMPING AND DRAINAGE

1. Contractor shall provide its own pumping and drainage.

2. When an area is released by one Contractor to another, the Contractor releasing an area shall be responsible for leaving it in a drained condition. The incoming Contractor shall assume responsibility for drainage on the day that he is scheduled to start work in the area. If the incoming Contractor is late in starting work, he shall assume responsibility for pumping and drainage arising as a result.

R. TEMPORARY BUILDING ENCLOSURES

1. The Construction Manager will equip all temporary exterior doors of the building with self-closing hardware and padlocks.

2. All other temporary enclosures and protection shall be provided by the Contractor requiring the protection.

3. Temporary enclosures required due to late delivery of materials or untimely installation of work shall be the responsibility of the Contractor responsible for the delay.

S. TEMPORARY POWER AND LIGHTING

1. Contractor shall provide all extension cords and outlets as required for obtaining electric power from power centers provided by the Electrical Contractor. Refer to Section 015113 - TEMPORARY ELECTRIC.

2. Contractor shall provide its own additional temporary lighting of sufficient lighting levels to properly install his work.

T. TEMPORARY HEAT

1. Contractor shall provide temporary heat as required for its operations. Once a building has reached the “Permanent Enclosure” stage, temporary heat will be provided as specified in Section 015123 - TEMPORARY HEAT AND VENTILATION.

2. Equipment and methods of temporary heating shall be reported to the Construction

Manager.

U. PROTECTION OF ADJACENT MATERIALS

1. Contractor shall protect adjacent materials and finishes from damage as a result of its work.

V. CLEAN UP

1. Contractor shall arrange for clean up and removal of debris resulting from its operations, and shall dispose of debris in accordance with the provisions of Paragraph 2.13 above. Clean up shall be on a continual basis to ensure that building, grounds and public properties are maintained free from accumulations of waste materials and trash.

2. The Contractor will limit use of and ensure that all materials, including waste, that are combustible or flammable will be removed from the building continually, as work progresses, **and at a minimum** at the end of each work day. All trash which is potentially edible or may attract rodents or insects will be disposed of in metal containers and removed by the end of the work day.

3. At completion of its Work, each Contractor shall remove waste materials, rubbish, tools, equipment, and clean up all exposed surfaces in preparation for final cleaning.

4. If, after notification in writing from the Construction Manager, the Contractor does not correct its deficiencies in housekeeping within twenty four (24) hours, the Construction Manager reserves the right to undertake the Work and to backcharge the Contractor.

5. Final clean up prior to Owner occupancy shall be arranged for by the Construction Manager.

W. DUST PROTECTION

1. Contractor shall erect and maintain dust proof protection whenever its operations will produce dust and dirt that might filter through the building into occupied or finished areas. Contractor shall be responsible for all cleaning required due to its failure to provide adequate dust protection.

X. PROTECTION OF EXISTING CONSTRUCTION

1. Contractor shall be responsible for all damage that it may cause to materials and equipment stored or installed by other Contractors.

Y. OTHER

1. Contractor shall provide any other Temporary Facilities and services that it requires and which are not specifically identified above.

3. PERMITS

3.1 The Construction Manager will obtain the Building Permit. All other permits are to be obtained and paid for by the Contractor requiring them.

4. EXECUTION

A. GENERAL

1. Contractor shall install all temporary facilities in accordance with applicable codes.

2. Contractor shall maintain temporary facilities for which it is responsible throughout the construction period.

3. Contractor shall remove all temporary facilities for which it is responsible when they are no longer required or when the Construction Manager directs the removal of same.

4. Contractor shall repair all damage to the Project Site caused by the installation of its temporary facilities.

END OF SECTION

SECTION 016200 - MATERIAL AND EQUIPMENT

1. GENERAL CONDITIONS

   A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate apply to the Work specified in this Section.

   B. Where work is to be executed under Separate Prime Contracts, the provisions of this Section apply to each Contract.

2. REQUIREMENTS INCLUDED

   A. All materials and equipment incorporated into the Work shall:

      1. be new;

      2. conform to applicable specifications and standards; and

      3 comply with size, make, type and quality specified, or as specifically approved in writing by the Architect.

   B. Manufactured and Fabricated Products shall conform to the following requirements:

      1. Designed, fabricated and assembled in accord with the best engineering and shop practices.

      2 Manufactured like parts of duplicate units to standard sizes and gauges, to be interchangeable.

      3. Two or more items of the same kind shall be identical, by the same manufacturer.

      4 Products shall be suitable for service conditions.

      5. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.

   C. Contractor shall not use materials or equipment for any purpose other than that for which it is designated or is specified.

   D. Materials removed from existing structures shall not be reused in the completed work unless specifically indicated or specified.

   E. For materials and equipment specifically indicated or specified to be reused in the Work:

      1. Contractor shall use special care on removal, handling storage and reinstallation, to assure proper function in the completed Work.

2. Arrange for transportation, storage and handling of products which require off-site storage, restoration or renovation. Pay all costs for such work.

3. MANUFACTURER'S INSTRUCTIONS

A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, Contractor shall obtain and distribute copies of such instructions to parties involved in the installation, including two copies to Construction Manager.

1. Maintain one set of complete instructions at the job site during installation and until completion.

B. Contractor shall handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements.

1. Should job conditions or specified requirements conflict with manufacturer's instructions, Contractor shall consult with Construction Manager for further instructions.

2. Contractor shall perform work in accord with manufacturer's instructions. Contractor shall not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

4. TRANSPORTATION AND HANDLING

A. Contractor shall arrange deliveries of Products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.

1. Deliver Products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.

2. Contractor shall immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that Products are properly protected and undamaged.

B. Contractor shall provide equipment and personnel to handle Products by methods to prevent soiling or damage to Products or packaging.

5. STORAGE AND PROTECTION

A. Contractor shall store Products in accord with manufacturer's instructions, with seals and labels intact and legible.

1. Contractor shall store Products subject to damage by the elements in weathertight enclosures.

2. Contractor shall maintain temperature and humidity within the ranges required by

manufacturer's instructions.

B. Exterior Storage

1. Contractor shall store fabricated Products above the ground, on blocking or skids, to prevent soiling or staining. Cover Products which are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.

2. Contractor shall store loose granular materials in a well-drained area on soiled surfaces to prevent mixing with foreign matter.

C. Contractor shall arrange storage in a manner to provide easy access for inspection. Contractor shall make periodic inspections of stored Products to assure that Products are maintained under specified conditions, and free from damage or deterioration.

D. Contractor shall store flammable materials so as to prevent contact with flames and fire. Conform with manufacturer's recommendations and local laws. Pay particular attention to storage of:

1. Roof insulation.

2. Roofing materials, including solvents.

3. Paint materials.

4. Cleaning and other solvents.

5. Fuels.

E. Protection after Installation:

1. Contractor shall provide substantial coverings as necessary to protect installed Products from damage from traffic and subsequent construction operations. Remove when no longer needed.

6. SUBSTITUTIONS AND PRODUCT OPTIONS

A. Product List.

1. Within 30 days after Contract Date, Contractor shall submit to Construction Manager a complete list of major products proposed to be used, with the name of the manufacturer and the installing Contractor.

B. Contractor's Options.

1. For Products specified only by reference standard, Contractor shall select any Product

meeting that standard.

2. For Products specified by naming several Products or manufacturers, Contractor shall select any one of the Products or manufacturers named which complies with the specifications.

3. For Products specified by naming one or more Products or manufacturers and "or equal", Bidders must, during the bidding period, submit a request for substitutions for any Product or manufacturer not specifically named. See provisions in Paragraph 6.C, below.

4. For Products specified by naming only one Product and manufacturer, there is no option; and Contractor shall provide the precise Product specified.

C. Substitutions.

1. The materials, products and equipment described in the Bidding Documents establish a standard of quality, required function, dimension, and appearance to be met by any proposed substitution. The specification of a particular manufacturer or model number is not intended to be proprietary in any way. Substitutions of products for those named will be considered, providing that the Vendor certified that the function, quality, and performance characteristics of the material offered is equal or superior to that specified. It shall be the Bidder's responsibility to assure that the propose4d substitution will not affect the intent of the design, and to make any installation modifications required to accommodate the substitution.

2. Requests for substitutions shall be made in writing to the Architect at least ten days prior to the date of the Bid Opening. Such requests shall include a complete description of the proposed substitution, drawings, performance and test data, explanation of required installation modifications due the substitution, and any other information necessary for an evaluation. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval shall be final. The Architect is to notify Owner prior to any approvals.

3. Until a date no later than seven (7) days before the date Bids are due, Architect will consider written requests from bidders for substitution of Products. **The contractor will submit any substitution requests to the Construction Manager for transmittal to the Architect. The** architect will review requests and will notify Bidders in an Addendum if the requested substitution is acceptable.

4. Should the Bidder desire a substitution, it shall submit a separate request for each Product, supported with complete data, with drawings and samples as appropriate, including:

   a. Comparison of the qualities of the proposed substitution with that specified.

   b. Changes required in other elements of the Work because of the substitution.

   c. Effect on the construction schedule.

d. Cost data comparing the proposed substitution with the Product specified.

e. Any required license fees or royalties.

f. Availability of maintenance service, and source of replacement materials.

5. Architect, in its sole discretion, shall be the judge of the acceptability of the proposed substitution.

6. A request for a substitution constitutes a representation that Bidder:

a. has investigated the proposed Product and determined that it is equal to or superior in all respects to that specified;

b. will provide the same warranties or bonds for the substitution as for the Product specified;

c. will coordinate the installation of an accepted substitution into the Work, and make such other changes as may be required to make the Work complete in all respects; and

d. waives all claims for additional costs, under his responsibility, which may subsequently become apparent.

D. Architect will review requests for substitutions with reasonable promptness, and notify Bidders, in writing, through the Construction Manager, of the decision to accept or reject the requested substitution. Any decision to accept a substitution must be confirmed in an Addendum issued during the bidding period in order to be valid. Oral approvals will not be binding.

E. The Architect shall have no obligation to consider any substitutions after the Contract award.

END OF SECTION

SECTION 017123 - FIELD ENGINEERING

1. GENERAL PROVISIONS

   A. The general provisions of the Contract, including the Conditions of the Contract, (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.

   B. The provisions of the section apply to all contracts.

2. SURVEY

   A. The Owner has had a site survey prepared by Site Studios. This information has been included in this Bid Pac.

3. CONSTRUCTION MANAGER

   A. The Construction Manager will establish a bench mark and base line from which structures and grades shall be laid out by Contractors as designated in this section. The total extent of this layout is shown on the site drawings. One bench elevation shall be provided.

END OF SECTION

SECTION 017329 - CUTTING AND PATCHING

1. GENERAL

A. Definition: "Cutting and Patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition.

B. Refer to Other Sections of these specifications for specific cutting and patching requirements and limitations applicable to individual units of work.

C. Structural Work: Do not cut and patch structural work in a manner resulting in a reduction of load carrying capacity or load deflection ratio. Submit proposal and request and obtain Architect's/Engineer's approval before proceeding with cut and patch of structural work.

D. Operational/Safety Limitations: Do not cut and patch operational elements and safety components in a manner resulting in decreased performance, shortened useful life, or increased maintenance. Submit proposals and requests and obtain Architect's/Engineer's approval before proceeding with cut and patches of structural work.

E. Visual/Quality Limitations: Do not cut and patch work exposed to view (exterior and interior) in manner resulting in noticeable reduction of aesthetic qualities and similar qualities, as judged by Architect/Engineer.

1. Engage the original Installer/Fabricator, or (if not available) an acceptable equivalent entity, to cut and patch the following categories of exposed work but not limited to

2. Exterior wall materials, ie., curtain wall

3. Finish floor materials, ie., substrate, carpet, ceramic tile

4. Walls

5. Ceilings

F. Limitation on Approvals: Architect's/Engineer's approval to proceed with cutting and patching does not waive right to later acquire removal/replacement of work found to be cut and patched in an unsatisfactory manner, as judged by Architect/Engineer.

2. MATERIALS

A. General: Use materials for cutting and patching that are identical to existing materials. If identical materials are not available, or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials for cutting and patching that will result in equal or better performance characteristics.

3. EXECUTION

A. Inspection: Before cutting, examine surfaces to be cut and patched and conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the work.

B. Temporary Support: To prevent failure provide temporary support of work to be cut.

C. Protection: Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations.

1. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

2. Take precautions not to cut existing pipe, conduit or duct serving the building but scheduled to be relocated until provisions have been made to bypass them.

D. Cutting: Cut the work using methods that are least likely to damage work to be retained or adjoining work. Where possible review proposed procedures with the original installer; comply with original installer's recommendations.

1. Where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as a carborundum saw or core drill. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut and drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.

E. Patching: Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.

1. Restore exposed finishes of patched areas and where necessary extend finish restoration into retained adjoining work in a manner which will eliminate evidence of patching and finishing.

END OF SECTION

SECTION 017700 – CONTRACT CLOSEOUT

1. DESCRIPTION OF REQUIREMENTS

A. Provisions of this section apply to the procedural requirements for the actual close out of the Work, not to the administrative matters such as final payment or the change over of insurance. Close out requirements relate to both substantial and final completion of the Work; they also apply to individual portions of completed work as well as the Total work. Specific requirements contained in other sections have precedence over the general requirements contained in this section.

2. PROCEDURES AT SUBSTANTIAL COMPLETION

A. Prerequisites: Contractor shall comply with the General Conditions and complete the following before requesting inspection of the Work, or a designated portion of the Work, for certification of substantial completion:

1. submit executed warranties, workmanship bonds, maintenance agreements, inspection certificates, releases of liens, tax certification and similar required documentation for specific units of work, and documents needed to enable Owner's unrestricted occupancy and use;

2. submit record documentation, maintenance manuals, tools, spare parts, keys and similar operational items;

3. complete instructions of Owner's operating personnel, and start up of systems; and

4. complete final cleaning and remove temporary facilities and tools.

B. Inspection Procedures: Upon receipt of Contractor's request, Architect/Engineer will either proceed with inspection or advise Construction Manger of prerequisites not fulfilled. Following initial inspection, Architect/Engineer will either prepare certificate of substantial completion, or advise Construction Manager of work which must be performed prior to issuance of certificate. The Architect/Engineer will repeat the inspection when requested and assure that the work has been substantially completed. Results of the completed inspection will form the initial "punch list" for final acceptance.

C. Punch List Procedures: Each Contractor shall be given a copy of the punch list with its appropriate work identified. Each Contractor shall be given 9 (nine) calendar work days to complete their punch list work. On the 10th day or as determined by the Construction Manager the Construction Manager shall employ other Contractors, as required, to complete any incomplete punch list work and retain from the appropriate Contractors retainage all costs incurred.

3. PROCEDURES AT FINAL ACCEPTANCE

A. Reinspection Procedure: The Architect/Engineer will reinspect the Work upon receipt of the

Contractor's notice that, except for those items whose completion has been delayed due to circumstances that are acceptable to the Architect/Engineer, the Work has been completed, including punch list items from earlier inspections. Upon completion of reinspection, the Architect/Engineer will either recommend final acceptance and final payment, or will advise the Contractor of work not completed or obligations not fulfilled as required for final acceptance. If necessary, this procedure will be repeated.

4. RECORD DOCUMENTATION

A. Record Drawings: Contractor shall maintain a complete set of either blue or black line prints of the contract documents and shop drawings for record mark-up purposes throughout the Contract Time. Contractor shall mark up these drawings during the course of the Work to show both changes and the actual installation, in sufficient detail to form a complete record for Owner's purposes giving particular attention to work that will be concealed and difficult to measure and record at a later date, and Work which may require servicing or replacement during the life of the project. Require the entities marking prints to sign and date each mark up. Bind prints into manageable sets, with durable paper cover, appropriately labeled.

B. Installation, Operation and Maintenance Manual: Contractor shall provide 3-ring vinyl covered binders containing required maintenance manuals, properly identified and indexed and including operating and maintenance instructions extended to cover emergencies, spare parts, warranties, inspection procedures, diagrams, safety, security, and similar appropriate data for each system of equipment item.

C. State Tax Certification: Contractor shall provide recent Delaware State Tax Certification form as issued by State of Delaware, Department of Finance, Division of Revenue, Carvel State Office Building, 820 N. French Street, Wilmington, Delaware 19801. To obtain this certificate, the contractor will be required to provide the Division of Revenue with the completed State Form 8821 DE along with a processing fee of $40.

D. AIA Documents: Contractors shall provide the following AIA documents with their final payment application submission:
- AIA G732, Application for Payment for 100% Complete
- AIA G732, Final Application for Payment for Retainage
- AIA G704-CMA, Certificate of Substantial Completion – 4 originals
- AIA G706, Affidavit of Payment of Debts & Claims
- AIA G706A, Affidavit of Release of Liens
- AIA G707, Consent of Surety

E. Release of Liens: Contractors shall provide the following release of liens with their final payment application submission:
- Prime Contractor's Release of Liens
- Subcontractors' & Suppliers' Release of Liens (major subs and suppliers)

5. GENERAL CLOSE OUT REQUIREMENTS

A. Operator Instruction: Contractor shall require each Installer of systems requiring continued operation and maintenance by Owner's operating personnel, to provide on location instruction to Owner's personnel, sufficient to ensure safe, secure, efficient, non-failing utilization and operation of systems. Contractor shall provide instructions for the following categories of work:

1. Mechanical/electrical/electronic systems (not limited to work of Division 15 and 16).

2. Roofing, flashing, joint sealers.

3. Floor finishes.

4. Door hardware

6. FINAL CLEANING

A. At the time of project close out Contractor shall clean or re-clean the Work to the condition expected from a normal, commercial building cleaning and maintenance program. Complete the following cleaning operations before requesting the Architect/Engineer's inspection for certification of substantial completion:

1. Remove non-permanent protections and labels.

2. Polish glass.

3. Clean exposed finishes.

4. Touch up minor finish damage.

5. Clean or replace mechanical systems filters.

6. Remove debris.

7. Broom clean unoccupied spaces.

8. Sanitize plumbing and food service facilities.

9. Clean light fixtures and replace burned out lamps.

10. Sweep and wash paved areas.

11. Police yards and grounds.

END OF SECTION

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Intrusion detection and video surveillance systems.
   6. Food service equipment.
   7. Pool equipment.
   8. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

A. Section 01 91 13 - General Commissioning Requirements: Additional requirements applicable to demonstration and training.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements and Section 01 33 00 - Submittal Procedures, for submittal procedures.

B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Architect for transmittal to Owner.
   2. Submit not less than four weeks prior to start of training.
   3. Revise and resubmit until acceptable.
   4. Provide an overall schedule showing all training sessions.
   5. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:
   1. Identification of each training session, date, time, and duration.
   2. Sign-in sheet showing names and job titles of attendees.
   3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.

E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
   1. Format: DVD Disc.
   2. Label each disc and container with session identification and date.

1.04 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstration may be combined with Owner personnel training if applicable.

C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

E. Provide minimum 8 hours equipment demonstration to Owner's staff. Demonstration is to be provided by a competent technician or mechanic working under the installing Contractor or the BAS vendor.

3.02 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Provide training in minimum two hour segments.

C. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

D. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

E. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.

5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
6. Discuss common troubleshooting problems and solutions.
7. Discuss any peculiarities of equipment installation or operation.
8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
9. Review recommended tools and spare parts inventory suggestions of manufacturers.
10. Review spare parts and tools required to be furnished by Contractor.
11. Review spare parts suppliers and sources and procurement procedures.

F. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

G. Provide minimum 8 hours of training to Owner's staff in operation of all systems installed under this contract. Training is to be provided by a competent technician or mechanic working under the installing Contractor or the BAS vendor.

END OF SECTION

COLONIAL SCHOOL DISTRICT
FACILITES AND SPECIAL PROJECTS
CONTRACT #4-23-01

VOLUME 2 OF 3

SPECIFICATIONS
FOR

JOHN G. LEACH SCHOOL

AT

2460 BEAR CORBITT ROAD
NEW CASTLE, DE 19720

PREPARED
BY

STUDIOJAED ARCHITECTS & ENGINEERS
2500 WRANGLE HILL ROAD
BEAR, DE 19701
STUDIOJAED PROJECT #22144

ISSUED FOR BID
OCTOBER 15, 2025

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SEALS PAGE

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SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.02 RELATED REQUIREMENTS

A. Section 03 20 00 - Concrete Reinforcing.

B. Section 03 30 00 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. See Structural Drawings for additional Reference Standards.

B. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

C. ACI 301 - Specifications for Structural Concrete; 2016.

D. ACI 347R - Guide to Formwork for Concrete; 2014, with Errata (2017).

E. PS 1 - Structural Plywood; 2009.

1.04 DESIGN REQUIREMENTS

A. Design and construct formwork, shoring and bracing to conform to code requirements; resultant concrete to conform to required shape, line and dimension.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. See Structural Drawings for additional Submittal Requirements.

1.06 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 347, ACI 301, and ACI 318.

B. Refer to Structural Drawings for additional Quality Assurance requirements and Inspection requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.

B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.

PART 2 PRODUCTS

2.01 GENERAL

A. See Structural Drawings for additional product requirements.

2.02 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct to provide resultant concrete that conforms to design with respect to shape, lines, and dimensions.

C. Comply with applicable State and local codes with respect to design, fabrication, erection, and removal of formwork.

2.03 WOOD FORM MATERIALS

A. Softwood Plywood: PS 1, B-B High Density Concrete Form Overlay, Class I.

B. Lumber: HEM-FIR species; #2 grade; with grade stamp clearly visible.

2.04 REMOVABLE PREFABRICATED FORMS

A. Preformed Steel Forms: Minimum 16 gage matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

2.05 FORMWORK ACCESSORIES

A. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.

B. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

PART 3 EXECUTION

3.01 GENERAL

A. See Structural Drawings for additional execution requirements.

3.02 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Obtain approval before framing openings in structural members that are not indicated on drawings.

F. Provide fillet strips on external corners of beams, joists, and columns.

G. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.

H. Coordinate this section with other sections of work that require attachment of components to formwork.

I. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect before proceeding.

3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Locate and set in place items that will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.06 FIELD QUALITY CONTROL

A. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.07 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

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SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories.

B. Section 03 30 00 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. See Structural Drawings for additional Reference Standards.

B. ACI 301 - Specifications for Structural Concrete; 2016.

C. ACI SP-66 - ACI Detailing Manual; 2004.

D. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018, with Editorial Revision.

F. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2016.

G. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2016.

H. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2017.

I. CRSI (DA4) - Manual of Standard Practice; 2009.

1.04 SUBMITTALS

See Section 01 30 00 - Administrative Requirements for submittal procedures.

A. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
   1. Prepare shop drawings under supervision of a Professional Structural Engineer experienced in design of work of this type and licensed in the State in which the Project is located.

B. Manufacturer's Certificate: Certify that reinforcing steel and accessories, products supplied for this project meet or exceed specified requirements.

C. See Structural Drawings for additional Submittal Requirements.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301.
   1. Maintain one copy of each document on project site.

B. Provide Architect with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.

C. Refer to Structural Drawings for additional Quality Assurance requirements and Inspection requirements.

PART 2 PRODUCTS

2.01 GENERAL

A. See Structural Drawings for additional product requirements.

2.02 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Plain billet-steel bars.
   2. Unfinished.
   3. Galvanized in accordance with ASTM A767/A767M, Class I.
   4. Epoxy coated in accordance with ASTM A775/A775M.

B. Reinforcing Steel: ASTM A706/A706M, deformed low-alloy steel bars.
   1. Unfinished.
   2. Galvanized in accordance with ASTM A767/A767M, Class I.
   3. Epoxy coated in accordance with ASTM A775/A775M.

C. Steel Welded Wire Reinforcement: Galvanized ASTM A 185/A 185M, plain type.
   1. Flat Sheets.
   2. Mesh Size and Wire Gage: As indicated on drawings.

D. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide galvanized components for placement within 1-1/2 inches of weathering surfaces.

2.03 RE-BAR SPLICING:

A. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing full steel reinforcing design strength in tension and compression.

B. Dowel Bar Splicer with Dowel-Ins: Mechanical devices for connecting dowels; capable of developing full steel reinforcing design strength in tension and compression.

C. Grout: Cementitious, non-metallic, non-shrink grout for use with manufacturer's grout sleeve reinforcing bar coupler system.

2.04 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Locate reinforcing splices not indicated on drawings at point of minimum stress.
   1. Review locations of splices with Architect.

PART 3 EXECUTION

3.01 GENERAL

A. See Structural Drawings for additional execution requirements.

3.02 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Conform to applicable code for concrete cover over reinforcement.

3.03 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 01 40 00 - Quality Requirements, will inspect installed reinforcement for compliance with contract documents before concrete placement.

B. Inspect installed reinforcement for conformance to contract documents before concrete placement.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 REFERENCE STANDARDS

A. See Structural Drawings for additional Reference Standards.

1.03 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:
   1. Section 31 20 00 "Earth Moving" for drainage fill under slabs-on-grade.
   2. Section 32 13 13 "Concrete Paving" for concrete pavement and walks.

1.04 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.05 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Concrete Subcontractor.
      e. Special concrete finish Subcontractor.
   2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot- weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, [methods for achieving specified floor and slab flatness and levelness and concrete protection.

1.06 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
   1. Location of construction joints is subject to approval of the Architect.

E. Samples: For vapor retarder.

F. See Structural Drawings for additional Submittal Requirements.

1.07 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, manufacturer & testing agency.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Curing compounds.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Vapor retarders.
11. Semirigid joint filler.
12. Joint-filler strips.
13. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency:
1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

F. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

G. Field quality-control reports.

H. Minutes of preinstallation conference.

I. See Structural Drawings for additional Submittal Requirements.

1.08 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

D. Refer to Structural Drawings for additional Quality Assurance requirements and Inspection requirements.

1.09 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

1.11 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M), and as follows:
   1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 PRODUCTS

2.01 GENERAL

A. See Structural Drawings for additional product requirements.

2.02 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301 (ACI 301M).
   2. ACI 117 (ACI 117M).

2.03 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

D. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2.04 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars, assembled with clips.

C. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.

D. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.05 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.06 CONCRETE MATERIALS

A. Cementitious Materials:
   1. Portland Cement: ASTM C 150/C 150M, Type I or Type II.
   2. Fly Ash: ASTM C 618, Class F.

B. Blended Hydraulic Cement: ASTM C 595/C 595M, Type IS, portland blast- furnace slag cement.
   1. Normal-Weight Aggregates: ASTM C 33/C 33M, coarse aggregate or better, graded. Provide aggregates from a single source.
      a. Maximum Coarse-Aggregate Size: 1-1/2 inches (38 mm) nominal.
      b. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C 260/C 260M.

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   2. Retarding Admixture: ASTM C 494/C 494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

E. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

F. Water: ASTM C 94/C 94M and potable.

2.07 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Fortifiber Building Systems Group; Moistop Ultra 15.
      b. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
      c. Meadows, W. R., Inc.; Perminator 15 mil.
      d. Raven Industries Inc.; Vapor Block 15.
      e. Stego Industries, LLC; Stego Wrap 15 mil Class A.

2.08 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. ChemTec Int'l; ChemTec One.
      b. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
      c. L&M Construction Chemicals, Inc.; Seal Hard.
      d. Meadows, W. R., Inc.; LIQUI-HARD.

2.09 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
      b. ChemMasters; SprayFilm.
      c. Euclid Chemical Company (The), an RPM company; Eucobar.
      d. L&M Construction Chemicals, Inc.; E-CON.
      e. Meadows, W. R., Inc.; EVAPRE.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap- polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
      b. ChemMasters; Safe-Cure Clear.
      c. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
      d. L&M Construction Chemicals, Inc.; L&M Cure R.
      e. Meadows, W. R., Inc.; 1100-CLEAR.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Anti-Hydro International, Inc.; AH Clear Cure WB.
      b. ChemMasters; Safe-Cure & Seal 20.
      c. Euclid Chemical Company (The), an RPM company; Aqua Cure VOX; Clearseal WB 150.
      d. L&M Construction Chemicals, Inc.; Dress & Seal WB.
      e. Meadows, W. R., Inc.; Vocomp-20.

2.10 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 or aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 according to ASTM D 2240.

C. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
   1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Reglets: Fabricate reglets of not less than 0.022-inch- (0.55-mm-) thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
   4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
   4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).
   1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
   1. Fly Ash: 25 percent.
   2. Combined Fly Ash and Pozzolan: 25 percent.
   3. Slag Cement: 50 percent.
   4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete for heavy- use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
   4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Normal-weight concrete.
   1. Minimum Compressive Strength: 3000 psi (20.7 MPa) at 28 days.
   2. Maximum W/C Ratio: 0.50.
   3. Slump Limit: 4 inches (100 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) plus or minus 1 inch (25 mm).
   4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch (38-mm) nominal maximum aggregate size.

B. Foundation Walls and Piers: Normal-weight concrete.
   1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
   2. Maximum W/C Ratio: 0.45.
   3. Slump Limit: 4 inches (100 mm) , plus or minus 1 inch (25 mm).
   4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch (38-mm) nominal maximum aggregate size.

C. Slabs-on-Grade: Normal-weight concrete.
   1. Minimum Compressive Strength: 5000 psi (34.5 MPa) exterior and 4000 psi (27.6 MPa) interior at 28 days.
   2. Maximum W/C Ratio: 0.45.
   3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
   4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch (38-mm) nominal maximum aggregate size.
   5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.14 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum- type batch machine mixer.
   1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
   2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
   3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 EXECUTION

3.01 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).

C. Construct forms tight enough to prevent loss of concrete mortar.

D. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast- concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   1. Install keyways, reglets, recesses, and the like, for easy removal.
   2. Do not use rust-stained steel form-facing material.

E. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting- type screeds.

F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

G. Chamfer exterior corners and edges of permanently exposed concrete.

H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
   2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
   3. Install dovetail anchor slots in concrete structures as indicated.

3.03 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form- removal operations, and curing and protection operations need to be maintained.
   1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
   3. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
   4. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.04 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
   1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

3.05 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
   1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.06 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
   3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
   5. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
   2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
   3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.07 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
   1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
   2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
   3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   2. Maintain reinforcement in position on chairs during concrete placement.
   3. Screed slab surfaces with a straightedge and strike off to correct elevations.
   4. Slope surfaces uniformly to drains where required.
   5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.08 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces not exposed to public view.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.09 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in one direction.
   1. Apply scratch finish to surfaces indicated and to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces indicated, to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
   2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
      a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
   1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 MISCELLANEOUS CONCRETE ITEM INSTALLATION

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:
   1. Coordinate sizes and locations of concrete bases with actual equipment provided.
   2. Construct concrete bases 4 inches (100 mm) high unless otherwise indicated, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
   3. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
   4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
   5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
   6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.11 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 (ACI 305.1M) for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture- retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
      a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
      b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
      c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
      a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
   4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 LIQUID FLOOR TREATMENT APPLICATION

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
   1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   2. Do not apply to concrete that is less than 28 days old.

3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

D. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

E. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:
1. Steel reinforcement placement.
2. Headed bolts and studs.
3. Verification of use of required design mixture.
4. Concrete placement, including conveying and depositing.
5. Curing procedures and maintenance of curing temperature.
6. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
    a. When frequency of testing provides fewer than five compressive- strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M.
    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in- place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION

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SECTION 04 05 11
MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mortar for unit masonry.

1.02 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry: Installation of mortar and grout.

B. Section 04 72 00 - Cast Stone Masonry

C. Section 08 11 13 - Hollow Metal Doors and Frames: Products and execution for grouting steel door frames installed in masonry.

1.03 REFERENCE STANDARDS

A. See Structural Drawings for additional Reference Standards.

B. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

C. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; American Concrete Institute International; 2008.

D. ASTM C5 - Standard Specification for Quicklime for Structural Purposes; 2018.

E. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2020.

F. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

G. ASTM C150/C150M - Standard Specification for Portland Cement; 2019a.

H. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

I. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019.

J. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2018.

K. ASTM C476 - Standard Specification for Grout for Masonry; 2019.

L. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2019.

M. ASTM C1019 - Standard Test Method for Sampling and Testing Grout for Masonry; 2019.

N. ASTM C1072 - Standard Test Methods for Measurement of Masonry Flexural Bond Strength; 2019.

O. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2018.

P. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry; 2014a.

Q. ASTM E518/E518M - Standard Test Methods for Flexural Bond Strength of Masonry; 2015.

R. IMIAWC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council; 1993.

S. IMIAWC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements and Section 01 33 00 - Submittal Procedures, for submittal procedures.

B. Product Data: Include design mix based on the Proportion specification of ASTM C 270 is to be used.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.07 FIELD CONDITIONS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.01 GENERAL

A. See Structural Drawings for additional product requirements.

2.02 MORTAR AND GROUT APPLICATIONS

A. At Contractor's option, mortar and grout may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.

B. Mortar Mix Designs: ASTM C270, Property Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Exterior Masonry Veneer: Type N.
   3. Exterior, Non-loadbearing Masonry: Type N.
   4. Interior, Loadbearing Masonry: Type S.
   5. Interior, Non-loadbearing Masonry: Type N.

C. Grout Mix Designs:
   1. Bond Beams and Lintels: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
   2. Engineered Masonry: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.

2.03 MATERIALS

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C387/C387M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   1. Color: Mineral pigments added as required to produce approved color sample.
   2. Water repellent mortar for use with water repellent masonry units.
   3. Manufacturers:
      a. Amerimix, and Oldcastle brand: AMX 400: www.amerimix.com..
      b. A/E Approved Equivalent.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

B. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.

C. Masonry Cement: ASTM C91.
   1. Type: Type N.
   2. Colored Mortar: Premixed cement as required to match Architect's color sample.
   3. Manufacturers:
      a. Solomon Colors; Solomon Colors Concentrated A, H, and X Series: www.solomoncolors.com/#sle.
      b. A/E Approved Equivalent.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

D. Portland Cement: ASTM C 150, Type I - Normal; color as required to produce approved color sample. Color must match existing building mortar color.

E. Hydrated Lime: ASTM C207, Type S.

F. Quicklime: ASTM C5, non-hydraulic type.

G. Mortar Aggregate: ASTM C144.

H. Grout Aggregate: ASTM C404.

I. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Color(s): As selected by Architect from manufacturer's full range, to match existing mortar.
   2. Manufacturers:
      a. Davis Colors
      b. Lambert Corporation
      c. Solomon Colors: www.solomoncolors.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

J. Water: Clean and potable.

K. Accelerating Admixture: Nonchloride type for use in cold weather.

L. Integral Water Repellent Admixture: Polymeric liquid admixture added to mortar at the time of manufacture.
   1. Performance of Mortar with Integral Water Repellent:
      a. Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours:
         1) No water visible on back of wall above flashing at the end of 24 hours.
         2) No flow of water from flashing equal to or greater than 0.032 gallons per hour at the end of 24 hours.
         3) No more than 25 percent of wall area above flashing visibly damp at end of test.
      b. Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.
      c. Compressive Strength: ASTM C1314; maximum 5 percent decrease.
   2. Use only in combination with masonry units produced with integral water repellent admixture.

2.04 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

D. If water is lost by evaporation, re-temper only within two hours of mixing.

E. Use mortar within two hours after mixing at temperatures of 90 degrees F, or two-and-one-half hours at temperatures under 40 degrees F.

2.05 GROUT MIXES

A. Bond Beams, Lintels, and Grouted Cores: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
   1. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
   2. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

B. Engineered Masonry: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
   1. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
   2. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.06 GROUT MIXING

A. Mix grout in accordance with ASTM C94/C94M.

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

D. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 EXECUTION

3.01 PREPARATION

A. Apply bonding agent to existing Masonry surfaces.

B. Plug clean-out holes for grouted masonry with block masonry units. Brace masonry to resist wet grout pressure.

3.02 INSTALLATION

A. Install mortar and grout to requirements of section(s) in which masonry is specified.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.

D. Do not displace reinforcement while placing grout.

E. Remove excess mortar from grout spaces.

3.03 GROUTING

A. Perform all grouting by means of low-lift technique. Do not employ high-lift grouting.

B. Low-Lift Grouting:
   1. Limit height of pours to 16 inches.
   2. Limit height of masonry to 16 inches above each pour.
   3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
   4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field tests, in accordance with provisions of Section 01 40 00 - Quality Requirements.

B. Test and evaluate mortar in accordance with ASTM C780 procedures.
   1. Test with same frequency as specified for masonry units.

C. Test and evaluate grout in accordance with ASTM C1019 procedures.
   1. Test with same frequency as specified for masonry units.

D. Prism Tests: Test masonry and mortar panels for compressive strength in accordance with ASTM C1314, and for flexural bond strength in accordance with ASTM C1072 or ASTM E518; perform tests and evaluate results as specified in individual masonry sections.

END OF SECTION

SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete Block.

B. Clay Facing Brick.

C. Reinforcement and Anchorage.

D. Installing Flashings.

E. Lintels.

F. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 78 39 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

B. Section 03 30 00 - Cast-in-Place Concrete: Reinforcing steel.

C. Section 04 05 11 - Masonry Mortaring and Grouting.

D. Section 05 50 00 - Metal Fabrications: Loose steel lintels and fabricated steel items.

E. Section 07 21 00 - Thermal Insulation: Insulation for cavity spaces.

F. Section 07 84 00 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.

G. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

A. See Structural Drawings for additional Reference Standards.

B. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

C. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International; 2008.

D. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

F. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2019.

G. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2018.

H. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018, with Editorial Revision.

I. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.

J. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

K. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

L. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2016, with Editorial Revision (2018).

M. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.

N. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction; 2012 (Reapproved 2019).

O. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale); 2017.

P. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2017.

Q. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.

R. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2017.

S. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2018a.

T. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

U. ASTM C150/C150M - Standard Specification for Portland Cement; 2019a.

V. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

W. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2019.

X. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019.

Y. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2018.

Z. ASTM C476 - Standard Specification for Grout for Masonry; 2019.

AA. ASTM C652 - Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale); 2019b.

AB. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units; 2016.

AC. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2019.

AD. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

AE. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

AF. IMIAWC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council; 1993.

AG. IMIAWC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

AH. UL (FRD) - Fire Resistance Directory; current edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Samples: Submit four samples of facing brick units to illustrate color, texture, and extremes of color range.

D. Manufacturer's Certificate: Certify that masonry units and brick meet or exceed specified requirements.

E. Certify that concrete masonry units used in firewall assemblies are of minimum equivalent thickness of 4" and that there is no calcareous or siliceous gravel aggregate used.

F. See Structural Drawings for additional Submittal Requirements.

1.05 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.
   1. Maintain one copy of each document on project site.

B. Fire Rated Assemblies: Conform to applicable code for UL Assembly No.

C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum ten years of documented experience.

1.06 MOCK-UP

A. Products of this section are to be included in full exterior wall construction mock-up panel as indicated on the drawings.
   1. Wall construction mock-up shall be utilized be utilized to confirm material and color selections.
   2. Wall construction mock-up shall demonstrate construction detail and quality and shall serve as benchmark for construction.
   3. Wall construction mock-up shall remain in place throughout construction of the building envelope and shall only be removed upon direction from the A/E.
   4. Locate mock-up where directed by Architect/Engineer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

1.09 EXTRA MATERIALS

A. See Section 01 60 00 - Product Requirements, for additional provisions.

B. Provide 50 of each size, color, and type of brick units for Owner use in maintenance of project.

PART 2 PRODUCTS

2.01 GENERAL

A. See Structural Drawings for additional product requirements.

2.02 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards fire rated, non fire rated and as follows:
   1. Size: Standard units with nominal face dimensions of 16 x 8 inches and nominal depth of 2, 4, 6, 8 inches, 10, 12, 14, 16 inches and/or as indicated on drawings.
   2. Special Shapes: Provide non-standard blocks configured for bull nose corners, lintels, headers, control joint edges, and bond beams and other conditions.
      a. **Provide bullnose units for outside corners.**
   3. Load-Bearing Units: ASTM C90, normal weight.
      a. Both hollow and solid block, as indicated.
         1) Supply grade N for all CMU construction.
      b. Exposed faces: Manufacturer's standard color and texture. Corridor walls to have ground face block where indicated.
      c. Exposed corners to be bull nose.
      d. First course is square to accommodate cove base.
   4. Non-Loadbearing Units: ASTM C129.
      a. Both hollow and solid block, as indicated.
      b. Normal weight.
      c. Exposed corners to be bull nose.
      d. First course is square to accommodate cove base.

2.03 BRICK UNITS

A. Manufacturers:

1. Belden Brick; Modular Commodore Full, Smooth, 20-09: www.beldenbrick.com/#sle.
2. Bowerston Shale Company; Sante Fe Smooth Modular: www.bowerstonshale.com/#sle.
3. A/E Approved Equal: Proposed equal must be submitted and approved prior to submission of bids..

B. Facing Brick: ASTM C216, Type FBS, Grade SW.
1. Color and texture to match Architect's sample.
2. Nominal size: Utility, 4 x 4 x 12 inches.
3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
4. Basis of Design: Belden Brick Company, Modular Commodore Full, Smooth, 20-09.

2.04 MORTAR AND GROUT MATERIALS

A. Mortar and grout: As specified in Section 04 05 11.

2.05 REINFORCEMENT AND ANCHORAGE

A. Manufacturers of Joint Reinforcement and Anchors:
1. Dur-O-Wal: www.dur-o-wal.com.
2. Hohmann & Barnard, Inc: www.h-b.com.
3. WIRE-BOND: www.wirebond.com/#sle.
4. A/E Approved Equivalent.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Reinforcing Steel: ASTM A615/A615M Grade 40 (280) deformed billet bars. uncoated

C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

D. Single Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Truss or ladder.
2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3.
3. Size: 0.1875 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

E. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Truss, with adjustable, two-let, hooked ties spaced at 16 in on center.
2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M, Class B.
3. Size: 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inchwire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
4. Vertical adjustment: Not more than 2 inches.

F. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face.
1. Steel frame: Crimped wire anchors for welding to frame, 0.25 inch thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B-2.

2.06 FLASHINGS

A. Metal Flashing Materials:
1. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 26 gauge, 0.0187 inch thick; finish 2B to 2D.

B. Stainless Steel/Polymer Fabric Flashing: ASTM A240/A240M; 2 mil type 304 stainless steel sheet bonded on one side to one sheet of polymer fabric.
1. Manufacturers:
a. 3GEN Masonry Products: www.3genmp.com/#sle.
b. Hohmann & Barnard, Inc; Mighty-Flash Stainless Flashing: www.h-b.com/#sle.
c. York Flashings: www.yorkflashings.com/#sle.

d. Substitutions: See Section 01 60 00 - Product Requirements.

2. Accessories:
   a. Two-piece, interlocking cavity wall flasing configured as indicated on drawings.
      1) Piece One: Installed at CMU wall with horizontal leg to bridge cavity insulation and down-surned outer leg with receiver for Piece Two.
      2) Piece Two: Installed with interlock to Piece One with horizontal let to bridge cavity and extend through facing brick with downturned, hemmed edge.
   b. Hemmed stainless steel drip plate.

C. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.

D. Termination Bars: Stainless steel; compatible with membrane and adhesives.

E. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.07 ACCESSORIES

A. Preformed Control Joints: Rubber or neoprene material.
   1. Manufacturers:
      a. Blok-Lok Limited: www.blok-lok.com/#sle.
      b. Dur-O-Wal: www.dur-o-wal.com.
      c. Hohmann & Barnard, Inc (including Dur-O-Wal brand); Product RS or VS: www.h-b.com/#sle.
      d. WIRE-BOND: www.wirebond.com/#sle.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

B. Joint Filler: Closed cell polyethylene; polyurethane or rubber oversized 50 percent to joint width; self expanding; 1 inch wide design width x by maximum lengths available.

C. Reglets: As specified on Section 07 62 00.

D. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
   1. Mortar Diverter: Stepped panels designed for installation at flashing locations.
      a. Manufacturers:
         1) Advanced Building Products, Inc: www.advancedbuildingproducts.com/#sle.
         2) Advanced Building Products Inc: www.advancedbuildingproducts.com/#sle.
         3) Mortar Net Solutions: www.mortarnet.com.
         4) Substitutions: See Section 01 60 00 - Product Requirements.

E. Weeps: Molded PVC grilles, insect resistant.
   1. Color(s): As selected by Architect from manufacturer's full range.
   2. Manufacturers:
      a. Advanced Building Products, Inc: www.advancedbuildingproducts.com/#sle.
      b. Hohmann & Barnard, Inc: www.h-b.com/#sle.
      c. Masonry Technology, Inc: www.mtidry.com/#sle.
      d. Mortar Net Solutions: www.mortarnet.com/#sle.
      e. A/E Approved Equivalent.
      f. Substitutions: See Section 01 60 00 - Product Requirements.

F. Cavity Vents: Polyester mesh; insect resistant or polypropylene extrusion.
   1. Same as weeps.

G. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.08 LINTELS

A. See Structural Drawings and 05 50 00 - Metal Fabrications for loose lintels.

2.09 MORTAR AND GROUT MIXES

A. Mortar and Grout mixes as specified in Section 04 05 11.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of items supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One units and one mortar joint to equal 8 inches.
   3. Common CMU Mortar Joints: Concave struck.
   4. Use flush joint on cavity side face of CMU where fluid applied air and vapor barrier is applied.

D. Brick Units:
   1. Bond: Running; One-third bond.
   2. Vertical Coursing: Two units and two mortar joints to equal 8 inches.
   3. Mortar Joints: Concave.

3.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Interlock intersections and external corners.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Set reglets as shown on plans.

H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

I. Cut mortar joints flush where wall tile is scheduled, cement parging is required, or resilient base is scheduled. Block exposed cavity space with raiseable steel guard of correct width.

J. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

K. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.06 WEEPS

A. Install weeps in veneer walls at 24 inches on center horizontally above opening, above through-wall flashing, above shelf angles and lintels, at bottom of walls, and as shown on drawings.

B. Install cavity vents in veneer and cavity walls at 24 inches on center horizontally below shelf angles and lintels and near top of walls.

3.07 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install cavity mortar diverter at base of cavity, at all through-wall flashing locations, and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.08 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.

E. Lap joint reinforcement ends minimum 8 inches.

F. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

G. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 16 inches horizontally and 16 inches vertically.

H. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches with at least 5/8 inch mortar cover to the outside face of the anchor.

3.09 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Reinforce joint corners and intersections with strap anchors 16 inches on center.

3.10 REINFORCEMENT AND ANCHORAGES - MULTIPLE WYTHE UNIT MASONRY

A. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

B. Place continuous joint reinforcement in first and second joint below top of walls.

C. Install reglets or embed top of flashing in masonry inner wythe joints.

D. Use individual metal ties installed in horizontal joints to bond wythes together. Provide ties spaced as shown on the drawings.

E. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Space anchors at maximum of 16 inches horizontally and 16 inches vertically.

G. Reinforce joint corners and intersections with strap anchors 16 inches on center.

3.11 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 8 inches into adjacent masonry and turn up at least 2 inches to form watertight pan at non-masonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Terminate flashing up 8 inches minimum on vertical surface of backing:
   1. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer's directions.
   2. Terminate vertical leg of flashing into bed joint in masonry or reglet in concrete.
   3. Anchor vertical leg of flashing into backing with a termination bar and sealant.
   4. Apply cap bead of sealant on top edge of self-adhered flashing.

C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

D. Extend metal flashings through exterior face of masonry and turn down to form drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.

E. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant, type as recommended by flashing manufacturer.

3.12 LINTELS

A. Install loose steel lintels over masonry all openings where other structrual lintels are not shown on drawings.

B. Maintain minimum 8 inch bearing on each side of opening.

3.13 GROUTED COMPONENTS

A. Reinforce bond beams as shown on plans.

B. Lap splices minimum 40 bar diameters.

C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

D. Place and consolidate grout fill without displacing reinforcing.

E. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.14 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control and expansion joints.

B. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.

C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

D. Form expansion joint as detailed.

E. Locate per drawings.

3.15 BUILT-IN WORK

A. As work progresses, install built-in metal door frames, glazed frames, fabricated metal frames, window frames, anchor bolts, plates, and boxes and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.

1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.16 TOLERANCES

A. Maximum Variation from Alignment of Columns and Pilasters: 1/8 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 20ft.

F. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.17 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.18 FIELD QUALITY CONTROL

A. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67 requirements, sampling 5 randomly chosen units for each 50,000 installed.

B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140 for conformance to requirements of this specification.

C. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.19 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.20 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

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SECTION 04 72 00
CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural cast stone.

1.02 RELATED REQUIREMENTS

A. Section 01 78 39 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

B. Section 04 05 11 - Masonry Mortaring and Grouting: Mortar for setting cast stone.

C. Section 04 20 00 - Unit Masonry: Installation of cast stone in conjunction with masonry.

D. Section 07 92 00 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.03 REFERENCE STANDARDS

A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

C. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2018, with Editorial Revision.

E. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

F. ASTM C150/C150M - Standard Specification for Portland Cement; 2019a.

G. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019.

H. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019.

I. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 2013.

J. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

K. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2010b.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Manufacturer's Qualification Data: Documentation showing compliance with specified requirements.

C. Product Data: Test results of cast stone components made previously by the manufacturer.
   1. Include one copy of ASTM C1364 for Architect's use.

D. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.

E. Mortar Color Selection Samples.

F. Verification Samples: Pieces of actual cast stone components not less than 12 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.

G. Source Quality Control Test Reports.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A current producer member of the Cast Stone Institute with a minimum of 10 years of experience in producing cast stone of the types required for project.

1. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.
2. Products previously produced by plant and exposed to weather that exhibit satisfactory appearance.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

1.06 MOCK-UP

A. Products of this section are to be included in full exterior wall construction mock-up panel as indicated on the drawings.
1. Wall construction mock-up shall be utilized be utilized to confirm material and color selections.
2. Wall construction mock-up shall demonstrate construction detail and quality and shall serve as benchmark for construction.
3. Wall construction mock-up shall remain in place throughout construction of the building envelope and shall only be removed upon direction from the A/E.
4. Locate mock-up where directed by Architect/Engineer.

B. See Section 01 40 00 - Quality Requirements for additional requirements.
1. Approved mock-up will become standard for appearance and workmanship.
2. Remove mock-up not incorporated into the work and dispose of debris.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.

B. Number each piece individually to match shop drawings and schedule.

C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.

E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.

F. Store mortar materials where contamination can be avoided.

G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Architectural Cast Stone:
1. Continental Cast Stone Manufacturing Company
2. D. C. Kerckoff Company
3. Hoyle Stone Products.
4. Pineapple Grove Designs
5. Russell Cast Stone
6. A/E Approved Equivalent.
7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.
1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C 1364.

3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 10 feet.
4. Color: Selected by Architect from manufacturer's full range.
5. Remove cement film from exposed surfaces before packaging for shipment.

B. Shapes: Provide shapes indicated on drawings.
1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
2. Unless otherwise indicated on drawings, provide:
a. Wash or slope of 1:12 on exterior horizontal surfaces.
b. Drips on projecting components, wherever possible.
c. Raised fillets at back of sills and at ends to be built in.

C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.
1. Pieces More than 12 inches Wide: Provide full length two-way reinforcement of cross-sectional area not less than 0.25 percent of unit cross-sectional area. Use epoxy coated reinforcement.

2.03 MATERIALS

A. Portland Cement: ASTM C150.
1. For Units: Type I, white or gray as required to match Architect 's selection.
2. For Mortar: Type I or II, except Type III may be used in cold weather to match mortar on existing building.

B. Coarse Aggregate: ASTM C33, except for gradation; granite, quartz, or limestone.

C. Fine Aggregate: ASTM C33, except for gradation; natural or manufactured sands.

D. Pigments: ASTM C979, inorganic iron oxides; do not use carbon black.

E. Admixtures: ASTM C494/C494M.

F. Water: Potable.

G. Reinforcing Bars: ASTM A615/A615M deformed bars, galvanized or epoxy coated.

H. Steel Welded Wire Reinforcement: ASTM A185/A185M, galvanized or epoxy coated.

I. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.

J. Mortar: Portland cement-lime, ASTM C270, Type N; as specified in Section 04 0511.

K. Sealant: As specified in Section .

L. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.

B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 20 00.

B. Mechanically anchor cast stone units indicated; set remainder in mortar.

C. Setting:
1. Drench cast stone components with clear, running water immediately before installation.

2. Set units in a full bed of mortar unless otherwise indicated.
3. Fill vertical joints with mortar.
4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.03 TOLERANCES

A. Joints: Make all joints 3/8 inch, except as otherwise detailed.
   1. Rake mortar joints 3/4 inch for pointing.
   2. Remove excess mortar from face of stone before pointing joints.
   3. Finish joints with backer rod and sealant with slight concave profile.
   4. Leave the following joints open for sealant:
      a. Joints labeled "expansion joint".

B. Sealant Joints: Install sealants as specified in Section 07 90 05.

C. Installation Tolerances:
   1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.
   2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
   3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.
   4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.04 CLEANING

A. Repair chips and other surface damage noticeable when viewed in direct daylight at 10 feet.
   1. Repair with matching touchup material provided by the manufacturer and in accordance with manufacturer's instructions.
   2. Repair methods and results subject to Architect 's approval.

B. Keep cast stone components clean as work progresses.

C. Clean completed exposed cast stone after mortar is thoroughly set and cured.
   1. Wet surfaces with water before applying cleaner.
   2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
   3. Remove cleaner promptly by rinsing thoroughly with clear water.
   4. Do not use acidic cleaners.

D. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

3.05 PROTECTION

A. Protect completed work from damage.

B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Structural steel.
   2. Field-installed shear connectors.
   3. Grout.

B. Related Requirements:
   1. Section 05 31 00 "Steel Decking" for field installation of shear connectors through deck.
   2. Section 05 50 00 "Metal Fabrications" for steel lintels and not attached to structural-steel frame, miscellaneous steel fabrications, and] other steel items not defined as structural steel.
   3. Section 09 90 00 “Paints and Coatings” for surface-preparation and priming requirements of exposed steel.

1.03 REFERENCE STANDARDS

A. See Structural Drawings for additional Standards.

1.04 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.05 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.06 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.07 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication of structural-steel components.
   1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   2. Include embedment Drawings.
   3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
   4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
   1. Power source (constant current or constant voltage).
   2. Electrode manufacturer and trade name, for demand critical welds.

D. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis date signed and sealed by the qualified professional engineer responsible for their preparation.

E. See Structural Drawings for additional Submittal Requirements.

1.08 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, fabricator, shop-painting applicators, professional engineer, testing agency.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural steel, including chemical and physical properties.

E. Product Test Reports: For the following:
   1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   2. Direct-tension indicators.
   3. Tension-control, high-strength, bolt-nut-washer assemblies.
   4. Shear stud connectors.
   5. Shop primers.
   6. Nonshrink grout.

F. Survey of existing conditions.

G. Source quality-control reports.

H. Field quality-control and special inspection reports.

I. See Structural Drawings for additional Submittal Requirements.

1.09 QUALITY ASSURANCE

A. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the work.

B. Installer Qualifications: Engage an experience installer who has completed structural steel work similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance.

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 and Endorsement P2 or to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

E. Comply with applicable provisions of the following specifications and documents:
   1. AISC 303.
   2. AISC 341 and AISC 341s1.
   3. AISC 360.
   4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

F. Refer to Structural Drawings for additional Quality Assurance requirements and Inspection requirements.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
   1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
   1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
   2. Clean and lubricate bolts and nuts that become dry or rusty before use.
   3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 PRODUCTS

2.01 GENERAL

A. See Structural Drawings for additional product requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.
   1. Select and complete connections using schematic details indicated and AISC 360.

B. Moment Connections: Type PR, partially restrained for lateral connections. Type FR, fully restrained for cantilever connections.

C. Construction: Moment frame and Braced frame.

2.03 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M, Grade 50 (345).

B. Channels, Angles, ASTM A 36/A 36M, Grade 50 (345).

C. Plate and Bar: ASTM A 36/A 36M and ASTM A 572/A 572M, Grade 50 (345).

D. Corrosion-Resisting Structural-Steel Shapes, Plates, and Bars: ASTM A 588/A 588M, Grade 50 (345).

E. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B structural tubing.

F. Corrosion-Resisting, Cold-Formed Hollow Structural Sections: ASTM A 847/A 847M, structural tubing.

G. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
   1. Weight Class: Standard.
   2. Finish: Black except where indicated to be galvanized.

H. Welding Electrodes: Comply with AWS requirements.

2.04 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.
   1. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.

B. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

C. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
   1. Configuration: Straight and threaded.

2. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
3. Plate Washers: ASTM A 36/A 36M carbon steel.
4. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
5. Finish: Plain unless noted otherwise.

D. Threaded Rods: ASTM A 36/A 36M.
1. Nuts: ASTM A 563 (ASTM A 563M) heavy-hex carbon steel.
2. Washers: ASTM A 36/A 36M carbon steel.
3. Finish: Plain unless noted otherwise.

E. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

F. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.

G. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

2.05 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, non asphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20 & ASTM A 780/A 780M.

2.06 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory- packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.07 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.08 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened, Pretensioned, or Slip critical.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.09 SHOP PRIMING

A. Shop prime steel surfaces except the following:
   1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
   2. Surfaces to be field welded.
   3. Surfaces of high-strength bolted, slip-critical connections.
   4. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
   1. SSPC-SP 2, "Hand Tool Cleaning."
   2. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
   2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

2.10 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
   1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
   2. Galvanize lintels attached to structural-steel frame and located in exterior walls.

2.11 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
   1. Liquid Penetrant Inspection: ASTM E 165.
   2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
   3. Ultrasonic Inspection: ASTM E 164.
   4. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

E. Prepare test and inspection reports.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedment's for compliance with requirements.
   1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedment's showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry- bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of baseplate.
   3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.04 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened or Slip critical.
   2. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
      a. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
         1) Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
         2) Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.05 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Verify structural-steel materials and inspect steel frame joint details.
   2. Verify weld materials and inspect welds.
   3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
   1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
      a. Liquid Penetrant Inspection: ASTM E 165.
      b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
      c. Ultrasonic Inspection: ASTM E 164.
      d. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

3.06 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC- SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Section 09 90 00 "Paints and Coatings."

END OF SECTION

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SECTION 05 21 00
STEEL JOIST FRAMING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. K-series steel joists.
   2. KCS-type K-series steel joists.
   3. K-series steel joist substitutes.
   4. Joist accessories.

B. Related Requirements:
   1. Section 04 20 00 "Unit Masonry" for installing bearing plates in unit masonry.

1.03 REFERENCE STANDARDS

A. See Structural Drawings for Reference Standards.

1.04 DEFINITIONS

A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

1.05 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings:
   1. Include layout, designation, number, type, location, and spacing of joists.
   2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
   3. Indicate locations and details of bearing plates to be embedded in other construction.
   4. See Structural Drawings for additional Submittal Requirements.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and professional engineer.

B. Welding certificates.

C. Manufacturer certificates.

D. Mill Certificates: For each type of bolt.

E. Field quality-control reports.

F. See Structural Drawings for additional Submittal Requirements.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."

B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Refer to Structural Drawings for additional Quality Assurance requirements and Inspection requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.09 SEQUENCING

A. Deliver steel bearing plates to be built into masonry construction.

PART 2 PRODUCTS

2.01 GENERAL

A. See Structural Drawings for additional product requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
   1. Use ASD; data are given at service-load level.
   2. Design special joists to withstand design loads with live-load deflections no greater than the following:
      a. Roof Joists: Vertical deflection of 1/360 of the span.
      b. Wind Uplift: All bar joists at roof shall be designed to resist a net uplift of 20 psf for all roof areas. Located bridging near the first bottom chord panel point and design all joist members to satisfy this additional loading condition.

2.03 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
   1. Joist Type: K-series steel joists and KCS-type K-series steel joists.

B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

C. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

D. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

E. Camber joists according to SJI's "Specifications."

F. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.04 PRIMERS

A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.05 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Fabricate steel bearing plates from ASTM A 36/A 36M steel with integral anchorages of sizes and thicknesses indicated. Hot-dip zinc coat according to ASTM A 123/A 123M.

C. Steel bearing plates with integral anchorages are specified in Section 05 50 00 "Metal Fabrications."

D. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch (13 mm) of finished wall surface unless otherwise indicated.
   1. Finish: Plain, uncoated.

E. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
   1. Finish: Plain.

F. Welding Electrodes: Comply with AWS standards.

G. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.06 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2.

B. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil (0.025 mm) thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.
   1. Before installation, splice joists delivered to Project site in more than one piece.
   2. Space, adjust, and align joists accurately in location before permanently fastening.
   3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
   4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

E. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.03 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Visually inspect field welds according to AWS D1.1/D1.1M.
   1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, at testing agency's option:
      a. Liquid Penetrant Inspection: ASTM E 165/E 165M.
      b. Magnetic Particle Inspection: ASTM E 709.
      c. Ultrasonic Testing: ASTM E 164.
      d. Radiographic Testing: ASTM E 94.

C. Visually inspect bolted connections.

D. Prepare test and inspection reports.

3.04 PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.
   1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2 or power-tool cleaning according to SSPC-SP 3.
   2. Apply a compatible primer of same type as primer used on adjacent surfaces.

END OF SECTION

SECTION 05 31 00
STEEL DECKING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Roof deck.
   2. Acoustical cellular roof deck.
   3. Composite floor deck.

B. Related Requirements:
   1. Section 03 30 00 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
   2. Section 05 12 00 "Structural Steel Framing" for shop- and field-welded shear connectors.
   3. Section 05 50 00 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
   4. Section 09 90 00 "Paints and Coatings" for repair painting of primed deck and finish painting of deck.

1.03 REFERENCE STANDARDS

A. See Structural Drawings for additional Reference Standards.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:
   1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

C. See Structural Drawings for additional Submittal Requirements.

1.05 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
   1. Power-actuated mechanical fasteners.
   2. Acoustical roof deck.

D. Evaluation Reports: For steel deck, from ICC-ES.

E. Field quality-control reports.

F. See Structural Drawings for additional Submittal Requirements.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

C. Refer to Structural Drawings for additional Quality Assurance requirements and Inspection requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
   1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

C. Rusty or mud-spattered decking shall not be erected.

PART 2 PRODUCTS

2.01 GENERAL

A. See Structural Drawings for additional product requirements.

2.02 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.03 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Canam United States; Canam Group Inc.
   2. CMC Joist & Deck.
   3. Consolidated Systems, Inc.; Metal Dek Group.
   4. Epic Metals Corporation.
   5. New Millennium Building Systems, LLC.
   6. Nucor Corp.; Vulcraft Group.
   7. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
   1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating.
   2. Deck Profile: As indicated.
   3. Cellular Deck Profile: As indicated.
   4. Profile Depth: As indicated.
   5. Design Uncoated-Steel Thickness: As indicated.
   6. Span Condition: Triple span or more.
   7. Side Laps: Overlapped.

2.04 ACOUSTICAL ROOF DECK

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:
   1. Canam United States; Canam Group Inc.
   2. CMC Joist & Deck.
   3. Consolidated Systems, Inc.; Metal Dek Group.
   4. Epic Metals Corporation.
   5. New Millennium Building Systems, LLC.
   6. Nucor Corp.; Vulcraft Group.
   7. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

C. Acoustical Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
   1. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
      a. Color: Manufacturer's standard.
   2. Deck Profile: As indicated.
   3. Cellular Deck Profile: As indicated.
   4. Profile Depth: As indicated.
   5. Design Uncoated-Steel Thickness: As indicated.
   6. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
   7. Span Condition: Triple span or more.
   8. Side Laps: Overlapped.
   9. Acoustical Perforations: Cellular deck units with manufacturer's standard perforated flat-bottom plate welded to ribbed deck.
   10. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber.
      a. Factory install sound-absorbing insulation into cells of cellular deck.
   11. Acoustical Performance: NRC 0.90, tested according to ASTM C 423.

2.05 COMPOSITE FLOOR DECK

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Canam United States; Canam Group Inc.
   2. CMC Joist & Deck.
   3. Consolidated Systems, Inc.; Metal Dek Group.
   4. Epic Metals Corporation.
   5. New Millennium Building Systems, LLC.
   6. Nucor Corp.; Vulcraft Group.
   7. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
   1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180 zinc coating.
   2. Profile Depth: 1-1/2 inches (38 mm).
   3. Design Uncoated-Steel Thickness: As indicated.
   4. Span Condition: Triple span or more.

2.06 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Galvanizing Repair Paint: ASTM A 780/A 780M.

I. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
   1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.03 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches (38 mm) long, and as follows:
   1. Weld Diameter: 5/8 inch (16 mm), nominal.
   2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches (305 mm) apart.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches (914 mm), and as follows:
   1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
   1. End Joints: Lapped 2 inches (51 mm) minimum or butted at Contractor's option.

D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
   1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.04 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
   1. Weld Diameter: 5/8 inch (16 mm), nominal.
   2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.
   3. Weld Spacing: Space and locate welds as indicated.
   4. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches (914 mm), and as follows:
   1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm) with end joints as follows:
   1. End Joints: Lapped or butted at Contractor's option.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Prepare test and inspection reports.

3.06 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of deck are included in Section 09 90 00 "Paints and Coatings."

END OF SECTION

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SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 REFERENCE STANDARDS

A. See Structural Drawings for additional Reference Standards.

1.03 SUMMARY

A. Section Includes:
   1. Exterior non-load-bearing wall framing.
   2. Ceiling joist framing.
   3. Soffit framing.
   4. All members indicated on drawings as "Cold-Formed" and/or 20 gauge or heavier.

B. Related Requirements:
   1. Section 05 50 00 "Metal Fabrications" for masonry shelf angles and connections.
   2. Section 09 21 16 "Gypsum Board Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed steel framing product and accessory.

B. Shop Drawings:
   1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
   2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated-Design Submittal: For cold-formed steel framing.

D. See Structural Drawings for additional Submittal Requirements.

1.06 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.
   1. Expansion anchors.
   2. Power-actuated anchors.
   3. Mechanical fasteners.

B. See Structural Drawings for additional Submittal Requirements.

1.07 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

D. Refer to Structural Drawings for additional Quality Assurance requirements and Inspection requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 PRODUCTS

2.01 GENERAL

A. See Structural Drawings for additional product requirements.

2.02 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. AllSteel & Gypsum Products, Inc.
   2. California Expanded Metal Products Company.
   3. ClarkWestern Building Systems, Inc.
   4. Consolidated Fabricators Corp.; Building Products Division.
   5. Craco Mfg., Inc.
   6. Custom Stud Inc.
   7. Design Shapes in Steel.
   8. Dietrich Metal Framing; a Worthington Industries Company.
   9. Formetal Co. Inc. (The).
   10. MarinoWARE.
   11. Nuconsteel; a Nucor Company.
   12. Olmar Supply, Inc.
   13. Quail Run Building Materials, Inc.
   14. SCAFCO Corporation.
   15. Southeastern Stud & Components, Inc.
   16. State Building Products, Inc.
   17. Steel Construction Systems.
   18. Steel Network, Inc. (The).
   19. Steel Structural Systems.
   20. Steeler, Inc.
   21. Super Stud Building Products, Inc.
   22. Telling Industries, LLC.
   23. United Metal Products, Inc.
   24. United Steel Manufacturing.

2.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
   1. Design Loads: As indicated.
   2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
      b. Ceiling Joist Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.
   3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
   4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

a. Upward and downward movement of 1 inch (25 mm).

5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Design Standards:
1. Wall Studs: AISI S211.
2. Headers: AISI S212.

D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.04 COLD-FORMED STEEL FRAMING, GENERAL

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: As required by structural performance.
2. Coating: G60 (Z180).

C. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: 33 (230) or 50 (340), Class 1.
2. Coating: G60 (Z180).

2.05 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: See drawings.
2. Minimum Flange Width: See drawings.
3. Minimum Section Properties: See drawings.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, un-punched, with un-stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches (32 mm).

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. AllSteel & Gypsum Products, Inc.
b. ClarkWestern Building Systems, Inc.
c. Dietrich Metal Framing; a Worthington Industries company.
d. MarinoWARE.
e. SCAFCO Corporation.
f. Steel Network, Inc. (The).
g. Steeler, Inc.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: As required by design (18 gauge minimum), or as indicated.
2. Flange Width: 1 inch (25 mm) plus the design gap for one-story structures and 1 inch (25 mm) plus twice the design gap for other applications.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; un-punched, with un-stiffened flanges.
1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
a. Minimum Base-Metal Thickness: As required by design (18 gauge minimum).
b. Flange Width: 1 inch (25 mm) plus the design gap for one-story structures and 1 inch (25 mm) plus twice the design gap for other applications.
2. Inner Track: Of web depth indicated, and as follows:
a. Minimum Base-Metal Thickness: As required by design (18 gauge minimum).
b. Flange Width: 1 inch (25 mm) plus the design gap for one-story structures and 1 inch (25 mm) plus twice the design gap for other applications.

F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.06 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: As required or indicated.
2. Flange Width: 1-5/8 inches (41 mm) minimum.

2.07 SOFFIT FRAMING

A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: As required or indicated.
2. Flange Width: 1-5/8 inches (41 mm), minimum.

2.08 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.09 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC- ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.10 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multi-monomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.11 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
   3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
   4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
   1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch (6 mm) to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.03 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
   1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.04 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
   1. Stud Spacing: 16 inches (406 mm) unless noted otherwise.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. Install single deep-leg deflection tracks and anchor to building structure.
   2. Install double deep-leg deflection tracks and anchor outer track to building structure.
   3. Connect vertical deflection clips to bypassing or infill studs and anchor to building structure.
   4. Connect drift clips to cold-formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.
   1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
      a. Install solid blocking at centers indicated on Shop Drawings.
   2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
   3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
   4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.05 CEILING JOIST AND SOFFIT INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

C. Space joists not more than 2 inches (51 mm) from abutting walls, and as follows:
   1. Joist spacing: 16 inches (406 mm) or as indicated.

D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.

E. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
   1. Bridging: Joist –track solid blocking of width and thickness indicated, secured to joist webs.
   2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

F. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

G. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.06 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.07 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.

1.02 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014, with Editorial Revision (2017).

E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

H. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc; 2011.

I. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

J. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1.05 QUALITY ASSURANCE

A. Design _____ under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172, with ten years documented experience.

C. Installer Qualifications: Installer with five years documented experience completing work similar to that specificed in this section.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

D. Slotted Channel Fittings: ASTM A1011/A1011M.

E. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.

F. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; galvanized finish.

B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.

C. Lintels: As detailed; galvanized finish.

D. Door Frames for coiling door openings: Channel sections; prime paint finish.

E. Slotted Channel Framing: Fabricate channels and fittings from structural steel complying with the referenced standards; factory-applied, rust-inhibiting thermoset acrylic enamel finish.

2.04 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Galvanize items where exposed to exterior.
   2. Exceptions: Galvanize items where exposeed at pool suite.
   3. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

C. Prime Painting: One coat.

D. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

D. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

END OF SECTION

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SECTION 05 51 00
METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stairs with concrete filled, metal pan treads.

B. Structural steel stair framing and supports.

C. Handrails and guards.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete fill in stair pans; mesh reinforcement for landings.

B. Section 05 52 13 - Pipe and Tube Railings: Metal handrails for the stairs specified in this section.

1.03 REFERENCE STANDARDS

A. See Structural Drawings for Reference Standards.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures; 2006.

D. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2019.

E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

G. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.

H. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric); 2014.

I. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.

J. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

K. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

L. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

M. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc; 2011.

N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

O. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

P. SSPC-SP 2 - Hand Tool Cleaning; 2018.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

2. Include the design engineer's stamp or seal on each sheet of shop drawings.

C. Delegated Design Data: As required by authorities having jurisdiction.

D. Welders' Certificates.

E. See Structural Drawings for additional Submittal Requirements.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

C. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.

D. Installer Qualifications: Company specializing in performing the work of this Section with minimum ten years of experience.

E. Refer to Structural Drawings for additional Quality Assurance requirements and Inspection requirements.

PART 2 PRODUCTS

2.01 GENERAL

A. See Structural Drawings for additional product requirements.

2.02 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.
   2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
   3. Structural Design: Provide complete stair and railing assemblies complying with the applicable local code.
   4. Dimensions: As indicated on drawings.
   5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   7. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Commercial: Exposed joints as inconspicuous as possible, whether welded or mechanical; underside of stair not covered by soffit IS considered exposed to view.
      a. Welded Joints: Intermittently welded on back side, filled with body putty, and sanded smooth and flush.
      b. Welds Exposed to View: Ground smooth and flush.
      c. Mechanical Joints: Butted tight, flush, and hairline.
      d. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts.
      e. Exposed Edges and Corners: Eased to small uniform radius.
      f. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for satin or matte finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.03 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Commercial, as defined above.

B. Risers: Closed.

C. Treads: Metal pan with field-installed concrete fill.
   1. Concrete Depth: 2-1/2 inches, minimum.
   2. Tread Pan Material: Bent steel plate, 10 gage minimum.
   3. Concrete Reinforcement: None.
   4. Concrete Finish: For resilient floor covering.

D. Risers: Same material and thickness as tread pans.

E. Stringers: Rolled steel channels.
   1. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Landings: Construction as indicated on Structural Drawings.

G. Railings: Steel pipe railings.

H. Finish: Shop- or factory-prime painted.

2.04 HANDRAILS AND GUARDS

A. Rails and Guards: As specified in Section 05 52 13.

2.05 MATERIALS

A. Steel Sections: ASTM A36/A36M.

B. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
   1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
   2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).

C. Concrete Fill: See Section 03 30 00.

2.06 ACCESSORIES

A. Steel Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

C. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, and comply with VOC limitations of authorities having jurisdiction.

2.07 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
   1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.
   2. Number of Coats: One.

PART 3 EXECUTION

3.01 GENERAL

A. See Structural Drawings for additional execution requirements.

3.02 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.03 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

3.04 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

D. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

E. Obtain approval prior to site cutting or creating adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.05 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 05 51 33
METAL LADDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prefabricated ladders.

B. Prefabricated ship ladders.

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

B. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008 (Reaffirmed 2018).

C. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings; 2018, with Editorial Revision.

D. ASTM B85/B85M - Standard Specification for Aluminum-Alloy Die Castings; 2018, with Editorial Revision.

E. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021.

F. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2019a.

G. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.

H. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

C. Specimen warranty.

D. Executed warranty.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for material and workmanship. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B211/B211M, 6063 alloy, T6 temper.

B. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.

C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210/B210M, 6061 alloy, T6 temper.

D. Aluminum-Alloy Bars: ASTM B211/B211M, 6061 alloy, T6 temper.

E. Aluminum-Alloy Sand Castings: ASTM B26/B26M.

F. Aluminum-Alloy Die Castings: ASTM B85/B85M .

G. Bolts, Nuts, and Washers: Stainless steel.

H. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by intermittent welds and plastic filler.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 PREFABRICATED LADDERS

A. Prefabricated Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
   1. Components: Manufacturer's standard rails, rungs, treads, handrails. returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
   2. Materials: Aluminum; ASTM B211/B211M, 6063 alloy, T52 temper.
   3. Finish: Mill finish aluminum.
   4. Manufacturers:
      a. Industrial Ladder & Scaffolding, Inc.: www.anyladder.com/#sle.
      b. O'Keeffe's Inc; Model 500: www.okeeffes.com/#sle.
      c. Precision Ladders, LLC; Fixed Alumnium Wall Ladder: www.precisionladders.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Prefabricated Ship Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
   1. Components: Manufacturer's standard rails, rungs, treads, handrails. returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
   2. Materials: Aluminum; 6063 alloy, T52 temper.
   3. Incline: 60 degrees.
   4. Finish: Manufacturer's standard clear anodized coating, comply with AAMA 611, Class 1.
   5. Manufacturers:
      a. Alaco Ladder Company: www.alacoladder.com/#sle.
      b. Lapeyre Stair: www.lapeyrestair.com/#sle.
      c. O'Keeffe's Inc; Model 520A: www.okeeffes.com/#sle.
      d. Precision Ladders, LLC: www.precisionladders.com/#sle.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 FINISHES - ALUMINUM

A. Exterior Aluminum Surfaces: Class I natural anodized.

B. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

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SECTION 05 52 13
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair and ramp railings and guardrails.

C. Stainless steel pool railings.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 04 20 00 - Unit Masonry: Placement of anchors in masonry.

C. Section 09 90 00 - Painting and Coating: Paint finish.

D. See Structural Drawings for additional Project Specifications.

1.03 REFERENCE STANDARDS

A. See Structural Drawings for Reference Standards.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

D. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2016.

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2020.

F. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plat, and Flat Bar; 2025

G. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2013, with Editorial Revision.

H. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

J. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel; 2017.

K. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc; 2011.

L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements or submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

C. See Structural Drawings for additional Submittal Requirements.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.

C. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.

D. Installer Qualifications: Company specializing in performing the work of this Section with minimum five years of experience.

E. Refer to Structural Drawings for additional Quality Assurance requirements and Inspection requirements.

PART 2 PRODUCTS

2.01 GENERAL

A. See Structural Drawings for additional product requirements.

2.02 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.

B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.

C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.

D. Allow for expansion and contraction of members and building movement without damage to connections or members.

E. Dimensions - Standard Railings: See drawings for configurations and heights.
   1. Top Rails and Wall Rails: 1-1/2 inches nominal diameter, round.
   2. Intermediate Rails: 1-1/2 inches nominal diameter, round.
   3. Intermediate Rails: 1-1/2 inches rectangular.
   4. Posts: 1-1/2 inches nominal diameter, round.
   5. Balusters: 1/2 inch square solid bar.

F. Dimensions - Pool Railings: See drawings for configurations and heights.
   1. Top Rails and Wall Rails: 1.9 inches nominal diameter, round.
   2. Intermediate Rails: 1.9 inches nominal diameter, round.
   3. Posts: 1.9 inches nominal diameter, round.

G. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
   2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
   3. For anchorage to stud walls, provide backing plates, for bolting anchors.
   4. Posts: Provide adjustable flanged brackets.

2.03 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500, Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A53/A53M, Grade B Schedule 80, black finish.

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Exposed Fasteners: No exposed bolts or screws.

E. Straight Splice Connectors: Steel concealed spigots.

F. Galvanizing at exterior railings: In accordance with requirements of ASTM A123/A123M.
   1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

2.04 STAINLESS STEEL RAILING SYSTEM

A. Stainless Steel: 316/L1.4401/1.4404, marine grade.

B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

C. Exposed Fasteners: No exposed bolts or screws.

2.05 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:

1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.01 GENERAL

A. See Structural Drawings for additional execution requirements.

3.02 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.03 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.04 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.05 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

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SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rough opening framing for doors, windows, and roof openings.

B. Roofing nailers.

C. Roofing cant strips.

D. Preservative treated wood materials.

E. Fire retardant treated wood materials.

F. Miscellaneous framing and sheathing.

G. Communications and electrical room mounting boards.

H. Wood nailers and curbs for roofing and items installed on roof.

I. Concealed wood blocking, nailers, and supports.

J. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

B. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

A. AFPA (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; American Forest and Paper Association; 2012.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

D. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).

E. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

G. AWPA U1 - Use Category System: User Specification for Treated Wood; 2018.

H. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems; 2014, with Editorial Revision (2017).

I. PS 1 - Structural Plywood; 2009.

J. PS 20 - American Softwood Lumber Standard; 2020.

K. SPIB (GR) - Grading Rules; 2014.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements.

B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.

C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.
   1. Lumber of other species or grades, or graded by other agencies, is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

B. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

C. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

1.06 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Douglas Fir-Larch, unless otherwise indicated.
   2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

B. Lumber fabricated from old growth timber is not permitted.

C. Provide sustainably harvested wood.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Southern Pine Inspection Bureau, Inc. (SPIB).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

E. Miscellaneous Blocking, Furring, Nailers, and Curbs:
   1. Lumber: S4S, No. 1 or Construction Grade.
   2. Boards: Standard.

2.03 CONSTRUCTION PANELS

A. Roof Sheathing, For parapet walls: APA Rated Sheathing, Exterior Exposure Class, Fire retardant treated, and as follows:
   1. Span Rating: 24/16.
   2. Thickness: 5/8 inch, nominal, or as noted w/ panel clips.

B. Wall Sheathing: Glass mat faced gypsum, ASTM C1177/C1177M, 5/8 inch Type X fire resistant.
   1. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   2. Edges: Square.
   3. Products:
      a. CertainTeed Corporation; GlasRoc Brand: www.certainteed.com/#sle.

b. Georgia-Pacific Gypsum; DensGlass Sheathing: www.gpgypsum.com/#sle.
c. USG Corporation; Securock Brand UltraLight Glass-Mat Sheathing Regular 5/8 in. (15.9 mm): www.usg.com/#sle.
d. USG Corporation; Securock Brand Glass-Mat Sheathing Regular 5/8 in. (15.9 mm): www.usg.com/#sle.
e. Substitutions: See Section 01 60 00 - Product Requirements.

C. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Fasteners and Anchors:
1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M; or Stainless Steel for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
3. Anchors: Toggle bolt type for anchorage to hollow masonry.

B. Termite-Resistant Sill Plate Barrier: Self-adhesive, film-backed barrier with release sheet; adheres to concrete substrates and blocks termite access.
1. Thickness: 68 mil, 0.068 inch.
2. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
1. Manufacturers:
a. Arch Wood Protection, Inc: www.wolmanizedwood.com/#sle.
b. Hoover Treated Wood Products, Inc: www.frtw.com/#sle.
c. Osmose, Inc: www.osmose.com/#sle.
d. Substitutions: Not permitted.
2. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
b. Do not use treated wood in direct contact with the ground.
3. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
b. Treat rough carpentry items as scheduled; or as indicated.
c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
   1. Manufacturers:
      a. Arch Wood Protection, Inc.: www.wolmanizedwood.com.
      b. Viance, LLC: www.treatedwood.com.
      c. Osmose, Inc: www.osmose.com.
      d. Substitutions: Not permitted.

D. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention.
   1. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
   2. Treat lumber in contact with roofing, flashing, or waterproofing.
   3. Treat lumber in contact with masonry or concrete.
   4. Treat lumber less than 18 inches above grade.
      a. Treat lumber in other locations as indicated.
   5. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention.
      a. Kiln dry plywood after treatment to maximum moisture content of 15 percent.
      b. Treat plywood in contact with masonry or concrete.
      c. Treat plywood in other locations as indicated.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.02 FRAMING INSTALLATION

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

D. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

E. Install structural members full length without splices unless otherwise specifically detailed.

F. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AFPA Wood Frame Construction Manual.

3.03 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

E. Specifically, provide the following non-structural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Bath accessories and toilet partitions.
   6. Wall-mounted door stops.
   7. Visual display, video monitors and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.
   10. Corner guards and wall paneling edges.
   11. Any additional wall mounted items not listed above.

3.04 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at each roof opening except where specifically indicated otherwise; form corners by alternating lapping side members.

3.05 INSTALLATION OF ACCESSORIES AND MISCELLANEOUS WOOD

A. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.

B. Coordinate curb installation with installation of decking and support of deck openings, roofing vapor retardant, and parapet construction.

3.06 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
   1. Nail panels to framing; staples are not permitted.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.

C. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.

3.07 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.08 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 74 19 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood casings and moldings.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum ten years of documented experience.

B. Installer Qualifications: Company specializing in installation of the products specified in this section with minimum five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

B. Protect from moisture damage.

C. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Interior Woodwork Items:

1. Moldings, Bases, Casings, and Miscellaneous Trim: Oak, rift sawn; prepare for stained finish.

2.02 FASTENINGS

A. Adhesive: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Fasteners: Of size and type to suit application.

2.03 ACCESSORIES

A. Wood Filler: Solvent base, tinted to match surface finish color.

2.04 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.05 SHOP FINISHING

A. Apply wood filler in exposed nail and screw indentations.

B. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

C. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Stain: As selected by Architect.
      c. Sheen: Flat.
   2. Finish of wood trim shall match wood slat sound-absorbing panels of Section 09 84 30.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 09 90 00 - Painting and Coating

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 12 36 00 - Countertops.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).

C. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum ten years of documented experience.

B. Installer Qualifications: Company specializing in installation of the products specified in this section with minimum five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.08 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Faced Cabinets: Custom grade.

C. Cabinets:
   1. Adjustable Shelf Loading: 50 lbs. per sq. ft.
   2. Cabinet Style: Flush overlay.
   3. Cabinet Doors and Drawer Fronts: Flush style.
   4. Drawer Side Construction: Manufacturer's option.
   5. Drawer Construction Technique: As recommended by fabricator.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

B. Core Materials:
   1. Plywood up to 3/4 inch thickness, CC/CD/CDC grades, of western softwood veneers, with NAUF exterior fully water resistant phenolic glues.
   2. Particleboard up to 7/8 inch thick: Industrial Grade average 45-pound density particleboard, ANSI A 208.1-2009, M-2 requirements.
   3. Particleboard 1 inch thick and thicker: Industrial Grade average 45-pound density particle-board, ANSI A 208.1-2009, M-2 requirements.
   4. Medium Density Fiberboard 1/4 inch thick: Minimum average density 45-50 lbs., ANSI A208.2-2009 requirements.
   5. MR Moisture Resistant Particleboard: Average 45-pound density particleboard, ANSI A208.1 1-2009, M-2 requirements.
   6. Toe Base Plywood: 3/4 inch thickness, CC/CD/CDC grades, of western softwood veneers, with NAUF exterior fully water resistant phenolic glues.

2.03 LAMINATE MATERIALS

A. Manufacturers:
   1. Arborite: www.arborite.com/#sle.
   2. Panolam Industries International, Inc: www.panolam.com/#sle.
   3. Wilsonart LLC: www.wilsonart.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Decorative Laminates: GREENGUARD Indoor Air Quality Certified
   1. High-pressure decorative laminate VGS (.028), NEMA Test LD 3-2005.
   2. High-pressure decorative laminate HGS (.048), NEMA Test LD 3-2005.
   3. High-pressure decorative laminate HGP (.039), NEMA Test LD 3-2005.
   4. High-pressure cabinet liner CLS (.020), NEMA Test LD 3-2005.
   5. High-pressure backer BKH (.048), (.039), (.028), NEMA Test LD3-2005.
   6. Thermally fused melamine TFL laminate, NEMA Test LD 3-2005. (TFL allowed on casework interiors only, as specified below. Utilization of TFL on any exterior casework surfaces, including door and drawer faces and finished ends, will not be permitted.)

C. Laminate Color Selection: As indicated on drawings.

2.04 EDGING MATERIALS:

A. 1mm PVC banding, machine applied.

B. 3mm PVC banding, machine applied and machine profiled to 1/8 inch radius.

2.05 COUNTERTOPS

A. Countertops are specified in Section 12 36 00.

2.06 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Fasteners: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

D. Concealed Joint Fasteners: Threaded steel.

E. Adjustable Drawer Organization Systems: Drawer trays, dividers, and connectors.
   1. Products:
      a. Blum, Inc; AMBIA-LINE; www.blum.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 SPECIALTY ITEMS

A. Support Members:
   1. Countertop support brackets: Epoxy powder coated, 11 gauge steel with integral cleat mount opening and wire management opening.
   2. Undercounter support frames: Epoxy powder coated.
   3. Legs: Epoxy powder coated.

2.08 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch spacing adjustments.
   1. Structural load to 1200 pounds (300 pounds per support) without failure.

C. Drawer and Door Pulls: Extruded aluminum pull, full width of drawer, satin finish.

D. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.

E. Drawer Slides:
   1. Type: Full extension.
   2. Static Load Capacity: Heavy Duty grade.
   3. Mounting: Side mounted.
   4. Stops: Integral type.
   5. Features: Provide self closing/stay closed type.
   6. Regular, kneespace and pencil: 100-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers. Positive stop both directions with self-closing feature. Paper storage, 150-pound load rated epoxy coated steel slides.
   7. File: Full extension, 150-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers. Positive stop both directions with self-closing feature.

F. Hinges: European style concealed self-closing type, steel with nickel-plated finish.
   1. Doors 48 inches and over in height have 3 hinges per door.

G. Soft Close Adapter: Concealed, frame-mounted, screw-adjustable damper; steel with polished finish.

2.09 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Fabricate casework, countertops and related products to dimensions, profiles, and details shown.

C. All casework panel components must go through a supplemental sizing process after cutting, producing a panel precisely finished in size and square to within 0.010 inches, ensuring strict dimensional quality and structural integrity in the final fabricated product.

D. Cabinet Body Construction:
   1. Tops and bottoms are glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals. Minimum 6 dowels each joint for 24 inch deep cabinets and a minimum of 4 dowels each joint for 12 inch deep cabinets. (Mechanical or metal hardware fasteners joining cabinet top and bottom panels to the sides will not be accepted.)
      a. Tops of all cabinets are plywood.
      b. Bottoms and sides of all cabinets are particleboard core.
   2. Cabinet backs: 1/4 inch thick medium density fiberboard panel fully captured by the cabinet top, bottom and side panels. Finish to match cabinet interior. 3/4 inch x 4 inch particleboard rails will be placed behind the back panel at the top and bottom, and doweled to the sides utilizing 10mm hardwood fluted dowels. A third intermediate rail will be

included on all cabinets taller than 56 inches. Utilize hot melt glue to further secure back and increase overall strength.
   a. Exposed back on fixed or movable cabinets: 3/4 inch thick particleboard with the exterior surface finished in VGS laminate as selected.
3. Fixed base and tall units have an individual factory-applied base, constructed of 3/4 inch thick plywood. Base is 102mm (nominal 4 inch) high unless otherwise indicated on the drawings.
4. Base units, except sink base units: Full sub-top glued and doweled to cabinet sides. (Mechanical or metal hardware fasteners joining cabinet sub-top panel to the sides will not be accepted.)
   a. Sink base units are provided with open top and a stretcher at the front, attached to the sides. Back to be split removable access panel.
5. Side panels and vertical dividers shall receive adjustable shelf hardware at 32mm line boring centers. Mount door hinges, drawer slides and pull-out shelves in the line boring for consistent alignment.
6. Exposed and semi exposed edges.
   a. Edging: 1mm PVC machine applied.
7. Adjustable Shelves in Cabinets
   a. Core: Particleboard.
   b. Core Thickness: 3/4 inch up to 30 inches wide, 1 inch over 30 inches wide.
   c. Edge: 1mm PVC on Front Edge Only.
8. Interior finish, units with open Interiors:
   a. Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with TFL Thermally Fused Melamine laminate.
9. Interior finish, units with closed Interiors:
   a. Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with TFL Thermally Fused Melamine laminate.
10. Exposed ends:
   a. Faced with high-pressure decorative VGS laminate. Use of TFL on exposed ends will not be permitted.
11. Wall unit bottom:
   a. Faced with thermally fused melamine laminate.
12. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), are not permitted.

E. Drawers:
1. Sides, back and sub front: Minimum 1/2 inch thick particleboard, laminated with TFL Thermally Fused Melamine doweled and glued into sides. Top edge banded with 1mm PVC.
2. Drawer bottom: Minimum 1/2 inch thick particleboard laminated with TFL Thermally Fused Melamine, screwed directly to the bottom edges of drawer box.
3. Paper storage drawers: Minimum 3/4 inch thick particleboard sides, back, and sub front laminated with TFL Thermally Fused Melamine. Minimum 1/2 inch thick particleboard drawer bottoms screwed directly to the bottom edges of the drawer box. Provide PVC angle retaining bar at the rear of the drawer.

F. Door/Drawer Fronts:
1. Core: 3/4 inch thick particleboard.
2. High-pressure decorative VGS laminate exterior, balanced with high-pressure cabinet liner CLS. Use of TFL on exterior or interior surfaces of door/drawer fronts will not be permitted.
3. Edges: 3mm PVC, machine applied, external edges and outside corners machine profiled to 1/8 inch radius.
4. Provide double doors in opening in excess of 24 inches wide.

G. Miscellaneous Shelving (not in Cabinets):
1. Core material: 3/4 inch plywood.

2. High-pressure decorative VGS laminate on both faces.
3. Edges: 3mm PVC, external edges and outside corners machine profiled to 1/8 inch radius.

H. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

I. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

J. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

2.10 COLOR SELECTION:

A. Laminate Color Selection:
1. Select from manufacturer's full range of color charts.
2. Thermally fused melamine laminate matched to White color.

B. PVC Edge Banding Color Selection:
1. 3mm PVC: Select from manufacturer's full range of patterns, woodgrains and solid colors.
2. 1mm PVC: Select from manufacturer's full range of patterns, woodgrains and solid colors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine the job site and the conditions under which the work under this section is to be performed, and notify the building owner in writing of unsatisfactory conditions. Do not proceed with work under this Section until satisfactory conditions have been corrected in a manner acceptable to the installer.

B. Verify adequacy of backing and support framing.

C. Verify location and sizes of utility rough-in associated with work of this section.

3.02 PREPARATION:

A. Condition casework to average prevailing humidity conditions in installation areas prior to installing.

3.03 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinets to floor using appropriate angles and anchorages.

F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.04 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.05 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

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SECTION 07 11 13
BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bituminous dampproofing.

B. Protection boards.

1.02 REFERENCE STANDARDS

A. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free; 2007 (Reapproved 2018).

B. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements.

B. Product Data: Provide properties of primer, bitumen, and mastics.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture of products of this section with at least ten years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with at least five years of documented experience.

1.05 MOCK-UP

A. Products of this section are to be included in full exterior wall construction mock-up panel as indicated on the drawings.
   1. Wall construction mock-up shall be utilized be utilized to confirm material and color selections.
   2. Wall construction mock-up shall demonstrate construction detail and quality and shall serve as benchmark for construction.
   3. Wall construction mock-up shall remain in place throughout construction of the building envelope and shall only be removed upon direction from the A/E.
   4. Locate mock-up where directed by Architect/Engineer.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until dampproofing has cured.

PART 2 PRODUCTS

2.01 BITUMINOUS DAMPPROOFING

A. Bituminous Dampproofing: Cold-applied, spray-grade; asphalt base, volatile petroleum solvents, and other content, suitable for application by spray, brush, roller, or squeegee; asbestos-free; suitable for application on vertical and horizontal surfaces.
   1. Composition: ASTM D4479/D4479M Type I, minimum, asbestos free.
   2. VOC Content: Not more than permitted by local, State, and federal regulations.
   3. Applied Thickness: 1/16 inch, minimum, wet film.
   4. Products:
      a. W. R. Meadows, Inc; Sealmastic Spray-Mastic: www.wrmeadows.com/#sle.
      b. A/E Approved Equivalent.

B. Primers, Mastics, and Related Materials: Type as recommended by dampproofing manufacturer.

2.02 ACCESSORIES

A. Protection Board: 1/8-inch thick biodegradable hardboard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.

C. Verify that items penetrating surfaces to receive dampproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive dampproofing.

B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.

C. Do not apply dampproofing to surfaces unacceptable to manufacturer.

D. Apply mastic to seal penetrations, small cracks, or minor honeycombs in substrate.

3.03 APPLICATION

A. Foundation Walls: Apply two coats of asphalt dampproofing.

B. Perform this work in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

C. Prime surfaces in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

D. Apply bitumen with roller.

E. Seal items watertight with mastic, that project through dampproofing surface.

F. Place protection board directly over dampproofing, butt joints, and adhere to tacky dampproofing.

G. Scribe and cut boards around projections, penetrations, and interruptions.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at perimeter foundation wall and underside of floor slabs.

B. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

C. Batt insulation for cavity wall construction.

D. Acoustic Batt insulation. See Section 09 21 16 Gypsum Board Assemblies.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Supporting construction for batt insulation.

1.03 REFERENCE STANDARDS

A. ASTM C240 - Standard Test Methods for Testing Cellular Glass Insulation Block; 2021.

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

C. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2017, with Editorial Revision (2018).

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

E. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2019.

F. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

G. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

H. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2019.

I. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2006.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

K. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

L. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.

M. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

N. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 MOCK-UP

A. Products of this section are to be included in full exterior wall construction mock-up panel as indicated on the drawings.
   1. Wall construction mock-up shall be utilized be utilized to confirm material and color selections.
   2. Wall construction mock-up shall demonstrate construction detail and quality and shall serve as benchmark for construction.
   3. Wall construction mock-up shall remain in place throughout construction of the building envelope and shall only be removed upon direction from the A/E.
   4. Locate mock-up where directed by Architect/Engineer.

1.06 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than ten years of documented experience.

B. Insulating Firm's Qualifications: Company specializing in the type of work required.
   1. Minimum of five years of experience.

1.08 SEQUENCING

A. Sequence work to ensure fireproofing, firestop, and vapor retarder materials are in place before beginning work of this section.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene board.

B. Insulation at Perimeter of Foundation: Extruded polystyrene board.

C. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene Board Insulation: ASTM C 578, Type IV; Extruded polystyrene board with natural skin surfaces; with the following characteristics:
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
   3. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   4. Board Size: 48 x 96 inch or 24 X 96 inch.
   5. Board Thickness: 2 inches,
   6. Board Edges: Square, Shiplap or Tongue and groove.
   7. Compressive Resistance: 25 psi and 40 psi.
   8. Board Density: 1.8 lb/cu ft.
   9. Water Absorption, maximum: 0.1 percent, volume.

B. Manufacturers:
   1. Dow Chemical Co(Design Basis):
      a. Cavity Wall - "Cavity Mate Plus", type IV
      b. Foundation and slabs - "Styrofoam Highload 40" type VI.
   2. Owens Corning Corp.
      a. Cavity Wall -= "Foamular 250", type IV
      b. Foundation and Slabs - "Foamular 400 SE", type VI.
   3. Pactiv Building Products
      a. Cavity Wall - "Green Board Score Board", type IV
      b. Foundation and Slabs - Type VI.

C. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 MINERAL FIBER BOARD INSULATION MATERIALS

A. **BID ALTERNATE:** Mineral Fiber Board Insulation over Weather Barrier is to be bid as an alternate to the Specified Closed-Cell Spray Foam with Intumescent Coating.

B. Mineral Wool Block, Board, or Blanket Thermal Insulation: Complying with ASTM C612 or ASTM C553.
   1. Where indicated, provide fiberglass reinforced polypropylene facing on one side; with flame spread index of 25 or less, when tested in accordance with ASTM E84.
   2. Flame Spread Index: 0 (zero), when tested in accordance with ASTM E84.
   3. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
   4. Board Size: 16 by 48 inches.
   5. Board Thickness at Metal Framed Construction: 2 inches.
      a. Thermal Resistance: Minimum R-value of 7.5.
   6. Board Thickness at Concrete Masonry Unit Construction: 2-1/2 inches.
      a. Thermal Resistance: Minimum R-value of 9.5.
   7. Thermal Resistance: R-value of 4.2 per inch at 75 degrees F, minimum, when tested in accordance with ASTM C518.
   8. Products:
      a. Johns Manville; CladStone 60 Water & Fire Block Insulation: www.jm.com/#sle.
      b. ROCKWOOL; CAVITYROCK: www.rockwool.com/#sle.
      c. Thermafiber, Inc: www.thermafiber.com/#sle.
   9. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 BATT INSULATION MATERIALS

A. Batt Insulation: ASTM C 665; preformed batt; friction fit, conforming to the following:
   1. Material: Rock or slag fiber, or glass fiber.
   2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   3. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
   4. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
   5. Formaldehyde Content: Zero.
   6. Thermal Resistance: In accordance with drawings.
   7. Thickness: Varies.
   8. Facing: Aluminum foil, flame spread 25 rated; one side.
   9. Manufacturers:
      a. CertainTeed Corporation: www.certainteed.com/#sle.
      b. Johns Manville Corporation: www.jm.com/#sle.
      c. Owens Corning Corp: www.owenscorning.com.
   10. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 ACCESSORIES

A. Tape: Bright aluminum; Polythylene or Polyester self-adhering type, mesh reinforced, 2 inch wide.

B. Support for Cladding and Continuous Insulation: Thermal clips.
   1. Thermally-broken clips that provide attachment support for girts, angles, channels, and other cladding support framing.
   2. Fasteners: As recommended by clip manufacturer.

C. Support for Cladding and Continuous Insulation: Continuous thermal Z-girts.
   1. Fiberglass reinforced plastic (FRP) girts that provide cladding attachment support for brick veneer and metal wall panels.
   2. Fasteners: As recommended by clip manufacturer.

D. Adhesive: Type recommended by insulation manufacturer for application and in compliance with Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.

B. Verify substrate surfaces are flat, free of irregularities or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Adhere a 6 inch wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints.
   2. Extend sheet full height of joint.

B. Apply adhesive to back of boards:
   1. Three continuous beads per board length.
   2. Full bed 1/8 inch thick.

C. Install boards horizontally on foundation perimeter.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.

D. Extend boards over expansion joints, unbonded to foundation on one side of joint.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION USING CLADDING AND CONTINUOUS INSULATION SUPPORTS

A. Install supports in accordance with manufacturer's installation instructions.

B. Install supports in compliance with system orientation, sizes, and locations as indicated on drawings and in accordance with approved shop drawings.

C. Install supports to fill in exterior wall spaces without gaps or voids in insulation.

D. Trim insulation neatly to fit spaces and provide a continuous thermal layer.

3.04 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.05 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior cavities at window, door, wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.

F. Staple or nail facing flanges in place at maximum 6 inches on center.

G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

3.06 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 21 19
FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Foamed-in-place insulation.
   1. In masonry cavity walls.
   2. In exterior framed walls.
   3. In exterior wall crevices.
   4. At junctions of dissimilar wall and roof materials.

B. Protective intumescent coating.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

B. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2019.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

E. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.

C. Certificates: Certify that products of this section meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

E. Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

F. Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified, with minimum five years of documented experience, and approved by manufacturer.

1.06 FIELD CONDITIONS

A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

B. Do not apply foam when temperature is within 5 degrees F of dew point.

PART 2 PRODUCTS

2.01 MATERIALS

A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, open cell or closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.

1. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment, and fire protection requirements.
2. Thermal Resistance: R-value of 5.0, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
3. Water Vapor Permeance: Vapor retarder; 2 perms, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
4. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
5. Air Permeance: 0.04 cfm per square foot, maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf.
6. Closed Cell Content: At least 90 percent.
7. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
8. Basis of Design:
   a. Huntsman Building Solutions; Heatlok HFO Pro: www.huntsmanbuildingsolutions.com/#sle.
9. Other Acceptable Products:
   a. BASF Corporation; WALLTITE US: www.spf.basf.com/#sle.
   b. Huntsman Building Solutions; ProSeal HFO: www.huntsmanbuildingsolutions.com/#sle.
   c. Johns Manville; JM Corbond III Closed Cell Spray Polyurethane Foam: www.jm.com/#sle.
   d. Preferred Solutions, Inc; Staycell 504 Closed Cell Spray Foam Insulation: www.preferredsolutions.net/#sle.
10. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

A. Primer: As required by insulation manufacturer.

B. Protective Coating: Intumescent coating of type recommended by insulation manufacturer and as required to comply with applicable codes.
   1. Coating Type: Single component, water-based.
   2. Protected Insulation Type: Spray polyurethane foam (SPF).
   3. Application: Apply using brush, roller, or airless sprayer.
   4. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
   5. Color: As indicated on drawings.
   6. Products:
      a. International Fireproof Technology Inc; DC315 Intumescent Coating: www.painttoprotect.com/#sle.
      b. International Coatings Group; FBL-100 Fire Barrier Latex: www.internationalcoatingsgroup.com/#sle.
      c. No-Burn, Inc; Plus ThB Intumescent Coating: www.noburn.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify work within construction spaces or crevices is complete before insulation application.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation adhesion.

3.02 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

C. Apply protective coating monolithically, without voids, to fully cover foam insulation, to achieve fire rating required.

D. Patch damaged areas.

E. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

F. Trim excess away for applied trim or remove as required for continuous sealant bead.

G. Trim excess away where applied thickness exceeds specification and impedes installation of other building materials and/or blocks cavity air space.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Field inspections and tests will be performed by an independent testing agency.

C. Inspection will include verification of insulation and protective coating thickness and density.

3.05 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

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SECTION 07 25 00
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-resistive barriers.

1.02 DEFINITIONS

A. Weather Barriers: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.

C. Water-Resistive Barrier: A material behind an exterior wall covering that is intended to resist liquid water that has penetrated behind the exterior covering from further intruding into the exterior wall assembly.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics.

C. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.05 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:

B. Manufacturer Qualifications: Company specializing in manufacture of roofing systems similar to those required for this project, with not less than ten years of documented experience.

C. Installer Qualifications: Company specializing in installing asphalt shingles, with at least five years of documented experience.

1.06 MOCK-UPS

A. Products of this section are to be included in full exterior wall construction mock-up panel as indicated on the drawings.
   1. Wall construction mock-up shall be utilized be utilized to confirm material and color selections.
   2. Wall construction mock-up shall demonstrate construction detail and quality and shall serve as benchmark for construction.
   3. Wall construction mock-up shall remain in place throughout construction of the building envelope and shall only be removed upon direction from the A/E.
   4. Locate mock-up where directed by Architect/Engineer.

1.07 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

A. **BID ALTERNATE:** Mineral Fiber Board Insulation over Weather Barrier is to be bid as an alternate to the Specified Closed-Cell Spray Foam with Intumescent Coating.

B. Water-Resistive Barrier: Provide on exterior walls under exterior cladding.

2.02 VAPOR RETARDER MATERIALS (AIR BARRIER AND WATER-RESISTIVE)

A. Vapor Retarder Coating: Liquid applied, resilient, UV-resistant coating and associated joint treatment.
   1. Water Vapor Permeance: 1.0 perm, maximum, when tested in accordance with ASTM E96/E96M.
   2. VOC Content: Less than 50 g per L when tested in accordance with 40 CFR 59, Subpart D (EPA Method 24).
   3. Suitable for use on concrete, masonry, plywood and gypsum sheathing.
   4. Joint Preparation Treatment: Coating manufacturer's recommended method, either tape or reinforcing mesh saturated with coating material.
   5. Manufacturers:
      a. Carlisle Coatings and Waterproofing, Inc; Barriseal-R: www.carlisleccw.com/#sle.
      b. Henry Company; Air-Bloc 16MR: www.henry.com/#sle.
      c. W.R. Meadows, Inc; Air-Shield LM or Air-Shield LM (All Season): www.wrmeadows.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   6. Joint Filler: As recommended by coating manufacturer and suitable to the substrate.

2.03 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Stainless Steel Flashing: Flexible flashing with 8 mil, 0.008 inch thick sheet of Type 304 stainless steel, 8 mil, 0.008 inch of butyl adhesive and a siliconized release liner.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Coatings:
   1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
   2. Use flashing to seal to adjacent construction and to bridge joints.

3.04 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 42 13
METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal panels for exterior wall panels and soffit panels, with insulation, related flashings, and accessory components.

1.02 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Wall panel substrate.

B. Section 07 92 00 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.

B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

C. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

D. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021.

F. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.

C. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.

D. Samples: Submit two samples of wall panel and soffit panel, 12 inches by 12 inches in size illustrating finish color, sheen, and texture.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum twenty years of documented experience.

B. Installer Qualifications: Company specializing in installing products specified in this section with minimum ten years of documented experience.

1.06 DESIGN AND PERFORMANCE CRITERIA.

A. General Performance: Metal wall panel assemblies shall be furnished and installed without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Rainscreen Wall System Performance Rating. The metal wall panel assemblies, and the sub-structural furring/framing system supporting the panels shall be tested in accordance with AAMA 509 and achieve the following performance results:
   1. Water Infiltration: The water infiltration performance of the metal wall panel assembly shall not exceed the classification of W-1.
   2. Back Ventilation: The air ventilation performance of the rainscreen cavity air space shall have a minimum classification of V-4.

C. Rainscreen Wall System Performance Rating. The metal wall panel assemblies, and the sub-structural furring/framing system supporting the panels shall be tested in accordance with AAMA 508-07 and achieve the following performance results: PASS.

D. Thermal Expansion and Contraction.
   1. Completed metal wall panel and flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, or reducing performance ability.
   2. The design temperature differential shall be not less than 220 degrees Fahrenheit.
   3. Interface between panel and clip shall provide for unlimited thermal movement in each direction along the longitudinal direction.

E. Uniform Wind Load Capacity.
   1. Installed wall system shall withstand negative wind pressures complying with the following criteria.
      a. Design Code: ASCE 7, Method 2 for Components and Cladding.
      b. Safety Factor: The metal panel system shall be tested to proof load of 1.5 times the design service load condition, as required by the ASTM E330 method.
      c. Risk Category III.
      d. Exposure Category C.
      e. Ultimate Design Wind Speed: 122 mph.
      f. Nominal Design Wind Speed: 95 mph,
      g. Height at Top of Wall System: 31 feet.

1.07 MOCK-UPS

A. Products of this section are to be included in full exterior wall construction mock-up panel as indicated on the drawings.
   1. Wall construction mock-up shall be utilized be utilized to confirm material and color selections.
   2. Wall construction mock-up shall demonstrate construction detail and quality and shall serve as benchmark for construction.
   3. Wall construction mock-up shall remain in place throughout construction of the building envelope and shall only be removed upon direction from the A/E.
   4. Locate mock-up where directed by Architect/Engineer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.09 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal wall panel work to be performed according to manufacturer's written instructions and warranty requirements.

B. Field Measurements: Verify actual dimensions of construction contiguous with metal wall panels by field measurements before fabrication.

1.10 COORDINATION

A. Coordinate sizes and locations of windows, doors, and wall penetrations with actual equipment provided.

B. Coordinate metal wall cladding system with wall sheathing, masonry, air and water resistive barriers, thermal insulation, rain drainage work, flashing, trim, and construction of other adjoining work to provide a leak proof, secure, and noncorrosive installation.

1.11 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Exterior metal cladding system Manufacturer's 10 year warranty against defective materials and fabrication.

C. Exterior metal cladding system Manufacturer's 20 year warranty for performance of prefinished finishes. The finish warranty shall provide coverage for the following:
   1. Fade Resistance: For a period of 20-years from date of first exposure to UV or weathering, the post-painted material finishes shall exhibit no more than a 5 "delta E" rating for color change from original color standard.
   2. Chalk Resistance: For a period of 20-years from date of first exposure to UV or weathering, the post-painted material finishes shall exhibit a chalk rating of 8 or less, in accordance with ASTM D4214, Method A.
   3. Film Integrity: For a period of 20-years from date of first exposure to UV or weathering, the post-painted material finishes shall not chip, peel, crack, or blister as a result of defective coatings, improper preparation of the substrate, improper application of the coatings, or improper curing of the coating system.

D. Installer's 3 year warranty covering wall panel system installation and watertightness.

E. Warranties shall commence on date of substantial completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Wall Panel Basis of Design: IMETCO. Innovative Metals Company, Inc.

B. Metal Ceiling Panel Basis of Design: Longboard Products.

C. Available Manufacturers: Subjset to requirements of the drawings and specifications, products from the following manufacturers may be provided. Products from Available Manufactures must be submitted and approved by A/E prior to submission of bid.
   1. Metal Wall & Ceiling Panels - Concealed Fasteners:
      a. Berridge Manufacturing Company: www.berridge.com/#sle.
      b. Construction Metal Products, Inc: www.cmpmetalsystems.com/#sle.
      c. IMETCO: https://imetco.com/
      d. MBCI: www.mbci.com/#sle.
      e. Longboard Products; www.longbordproducts.com/#sle.
      f. Petersen Aluminum Corporation: www.pac-clad.com/#sle.
      g. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 TYPE-1: CONCEALED CLIP – REVEAL JOINT METAL WALL PANELS

A. General: Provide factory-formed metal wall panels designed to be field assembled by interlocking seams and incorporating concealed fasteners.

B. Concealed clip, longitudinal lap-seam panel with labyrinth-joint and reveal on four sides.
   1. Basis-of-Design: IMETCO ELEMENT Wall system as manufactured by Innovative Metals Company, Inc. (IMETCO); Norcross, Georgia; telephone 1-800-646-3826.
   2. Material: Aluminum sheet, 0.080 inch thick.
   3. Characteristics.
      a. Fabrication: Panels shall be factory formed from specified metal.
      b. The standard profile shall be flat pans with reveal joints on all four sides.

c. Panel orientation: Horizontal.
d. Configuration (Horizontal): Panel shall be 20-inch high, nominal, by varying lengths as illustrated on building elevations, with interlocking seams incorporating concealed fasteners.
e. Panel Depth (Concealed Leg Height): 1 1/4 inch (32 mm), nominal.
f. Reveal Joint: Panel seams shall join such that adjacent panels form vertical and horizontal reveal joints 3/4-inch wide.
   1) Horizontal reveal joints shall be aligned from panel to panel, as shown on drawings.
   2) Vertical reveal joints shall be aligned from panel to panel, as shown on drawings.
g. End Folds: Panel ends shall be factory notched by automatic mechanical press equipment to form end tabs of 1 inch nominal length. The end tabs shall be factory folded 90 degrees to produce a “box pan” effect and allow for reveal joints on all four sides of the panel. Vertically oriented panels have a double end fold.

2.03 TYPE-2: CONCEALED FASTENER WALL PANELS

A. General: Provide factory-formed metal wall panels designed to be field assembled by interlocking seams and incorporating concealed fasteners.

B. Concealed clip, lap-seam wall panels 16 inch wide with 8 inch reveal.
   1. Basis-of-Design: IMETCO LATITUDE, LW-13, Wall system as manufactured by Innovative Metals Company, Inc. (IMETCO), Norcross, Georgia, telephone 1-800-646-3826.
   2. Material: Aluminum sheet, 0.040 inch think.
   3. Characteristics.
      a. Fabrication: Panels shall be factory formed from specified metal.
      b. The standard profile shall be smooth with indicated reveal spacing.
      c. Panel orientation: Horizontal.
      d. Configuration (Horizontal): Panel shall be 16-inch high, nominal, with 8 inch reveal, by varying lengths as illustrated on building elevations, with interlocking seams incorporating concealed fasteners.
      e. Panel Depth (Concealed Leg Height): 1 inch (32 mm), nominal.
      f. Reveal Joint: Panel seams shall join such that adjacent panels form vertical and horizontal reveal joints 3/4-inch wide.
         1) Horizontal reveal joints shall be aligned from panel to panel, as shown on drawings.
         2) Vertical reveal joints shall be aligned from panel to panel, as shown on drawings.

2.04 TYPE-3: TONGUE & GROOVE METAL WALL & CEILING PANEL SYSTEM

A. General: Provide factory-formed metal wall panels designed to be field assembled by tongue and groove interlock and incorporating concealed fasteners.

B. Tongue & Groove Wall Panel & Ceiling System:
   1. Basis-of-Design: Longboard Products, Tongue & Groove Classing System.
   2. Material: Aluminum sheet, 0.040 inch thick
   3. Configuration: 12" wide panel with 6" reveal.
   4. Finish: Woodgrain to be selected from manufacturer's full range of woodgrain selections.
   5. Trims and Accessories: Finish to match panel finish.
   6. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
   7. Design Pressure: In accordance with ASCE 7 and structural calculation's on S-001.
   8. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
   9. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
   10. Warranty: 15 year finish warranty. 50 year panel warranty.

C. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

D. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

E. Anchors: Galvanized steel.

2.05 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Prevent unpainted metals from contact with oils or solvents, including fingerprints, which may cause staining of the natural finishes.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast. Note that some variation is anticipated and acceptable when natural (unpainted) material finishes are specified.

E. Exposed Surface Finish: Two-coat, polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer’s standard line.
   1. Exposed surface coating system shall provide nominal 1.2 mil (0.030 mm) dry film thickness, consisting of primer and color coat.

F. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

2.06 ACCESSORIES

A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653, G90 (Z275) hot-dip galvanized

B. Support for Cladding and Continuous Insulation: Continuous thermal Z-girts.
   1. Depth: 3 inches.
   2. Spacing: 16 inches on center, vertically or horizontally.

C. Support for Cladding and Continuous Insulation: Hat-shaped Vented Girts.
   1. Dimensions:
      a. Nominal Thickness: 0.043-inch (18 gauge) (1.1-mm) nominal thickness.
      b. Depth: 1-inch (22 mm) nominal.
      c. Top flange: 2-1/2 inches (63.5 mm) nominal.
      d. Bottom Flanges: 1-3/8 inches (35 mm) nominal with 1/4 inch (6 mm) holes punched at 8” on center in each flange.
   2. Free air flow: The vented girt shall not restrict chimney effect air convection in the vertical direction. The vented girt webs shall have slotted holes providing for 31% free air flow and weep holes for water drainage.
   3. Drainage: Web segments of vented girt shall be formed such that when installed in the horizontal orientation the web segments are inclined at least 15 degrees from horizontal to promote drainage and prevent retention of standing water.

D. Wall Panel Accessories: Provide components approved by panel manufacturer and as required for a complete metal wall panel assembly including trim, corner units, closures, clips, flashings, sealants, gaskets, fillers, and similar items. Match material and finish of metal wall panels unless otherwise indicated.
   1. Anchor Clips: Clips shall be 18 gauge galvanized steel designed to allow thermal movement of the panel in each direction along the longitudinal dimension.

2. Corner Units: Provide factory fabricated mitered corner units of the same profile(s) as specified. Corner units shall be furnished for outside and inside corner conditions.
3. Ventilation strips shall be provided at top of wall panels, window sills, and transitions between metal panels and other exterior finish materials to allow for air exhaust at top of wall cavity. Vent strips shall be internally baffled to prevent wind driven rain from freely entering the wall cavity.
4. Ventilation strips shall be provided at base of wall panels, window head, and transitions between metal panels and other exterior finish materials to allow for air intake and water weep holes at bottom of wall cavity.

E. Flashing and Trim: Formed from same material, finish, and gauge as wall panels. Provide flashing and trim as required to provide finished appearance. Locations include, but are not limited to, head, sill, corners, jambs, framed openings, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

F. Fasteners for Metal Sub-framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal subframing members through insulation and sheathing boards into structural wall framing or substrates.

G. Sealants:
1. Sealant Tape: Non-curing, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1-inch- (13-mm-) wide and 1/16-inch- (3-mm-) thick.
2. Exposed Sealant: ASTM C 920; elastomeric tripolymer, polyurethane, or other advanced polymer sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer.
3. Concealed Sealant: ASTM C 1311: Butyl-Based, Solvent-Release, One-Part Sealant.

H. Field Touch-up Paint: As recommended by panel manufacturer.

I. Bituminous Paint: Asphalt base.

2.07 FABRICATION

A. Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Form flashing components from full single width sheet in minimum 10’-0” (3 m) sections. Provide mitered trim corners, joined using closed end pop rivets and butyl-based, solvent released one-part sealant.

D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Sealed Joints: Form non-expanding but movable joints in metal to accommodate butyl-based sealant to comply with SMACNA standards.
3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
4. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal wall panel manufacturer for application, but not less than thickness of metal being secured.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

3.02 PREPARATION

A. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

3.03 INSTALLATION

A. Install panels on walls and soffits in accordance with manufacturer's instructions.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint; allow to dry prior to wall panel installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Locate joints over supports.

E. Lap panel ends 2 inches, minimum.

F. Provide expansion and control joints where indicated.

G. Use concealed fasteners unless otherwise indicated by Architect.

H. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.04 TOLERANCES

A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch, maximum.

B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch, maximum.

3.05 CLEANING

A. Remove site cuttings from finish surfaces.

B. Remove protective material from wall panel surfaces.

C. Upon completion of installation, thoroughly clean prefinished aluminum surfaces in accordance with AAMA 609 & 610.

3.06 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

END OF SECTION

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SECTION 07 53 00
ELASTOMERIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Elastomeric roofing membrane, mechanically fastened conventional and adhered conventional application.

B. Insulation, flat and tapered.

C. Vapor retarder.

D. Deck sheathing.

E. Cover boards.

F. Flashings.

G. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood nailers and curbs.

B. Section 06 10 00 - Rough Carpentry: Wood cant strips.

1.03 REFERENCE STANDARDS

A. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

B. ASTM C1278/C1278M - Standard Specification for Fiber-Reinforced Gypsum Panel; 2007a (Reapproved 2011).

C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2019.

D. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016.

E. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2018).

F. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers; 2000 (Reapproved 2020).

G. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact; 2020.

H. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015.

I. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

J. FM (AG) - FM Approval Guide; current edition.

K. FM DS 1-28 - Wind Design; 2016.

L. NRCA (WM) - The NRCA Waterproofing Manual; 2005.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of associated counterflashings installed under other sections.

B. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers; review preparation and installation procedures and coordination and scheduling necessary for related work.

1.05 DESIGN CRITERIA

A. Wind Uplift Performance:
   1. Roof system shall be designed to withstand wind uplift forces as calculated using the current revision of ASCE-7.

2. Ultimate Design Wind Speed: 122 mph.
3. Wind Uplift Pressures: As indicated on structural drawings.

B. Fire Resistance Performance:
1. Roof system shall achieve a UL Class A rating when tested in accordance with UL-790.

C. Thermal Performance: Roff system shall achieve a minuminm R-value not less than R-30.

D. Drainage: Provide roof system with positive drainage where all standing water dissipates within 48 hours after precipitation ends.

E. Building Codes: Roof system shall meet the requirements of all federal, state, and local code bodies having jursidiction.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.

C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, mechanical fastener layout, and paver layout.

D. System Assembly Letter: Indicate compliance with specification requirements and with wind load requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum twenty years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum ten years documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.

C. Store materials in weather protected environment, clear of ground and moisture.

D. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

E. Protect foam insulation from direct exposure to sunlight.

1.09 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above 90 degrees F.

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.10 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. **System Warranty: Provide manufacturer's Total System warranty, including edge terminations, with single-source coverage and no monetary limitation where the manufacturer agrees to repair or replace components in the roofing system, which cause a leak due to a failure in materials or workmanship.**
   1. Comply with warranty procedures required by manufacturer, including notifications, scheduling, and inspections.
   2. Limit of Liability: No dollar limitation.
   3. Covered components include roofing membrane, liquid-applied membrane or coating, base flashing, high wall waterproofing flashing, insulation, expansion joint covers, pre-flashed accessories, and metal flashings manufactured by, or approved by, the roof system manufacturer that meet SMACNA standards.
   4. Warranty shall include materials and workmanship of listed products within this section.
   5. Warranty Term: 20 years.
   6. For repair and replacement include costs of both material and labor in warranty.
   7. Exceptions are not Permitted:
      a. Damage due to roof traffic.
      b. Damage due to wind speed less than 120 miles per hour.

PART 2 PRODUCTS

2.01 GENERAL

A. The components of this roofing system are to be products of the primary membrane manufacturer or accepted by the primary membrane manufacturer as compatible. All system materials, components, and installation shall be covered under the manufacturer's full system warranty.

2.02 MANUFACTURERS

A. EPDM Roof System Materials Basis of Design: Carlisle Roofing Systems, Inc., Sure-Tough, 60-mil EPDM, black.

B. EPDM Membrane Materials: Subject to compliance with requirements of drawings and specifications, materials from the following manufacturers may be provided. Only manufacturers and systems carry the specified full-system, edge-to-edge warranty will be considered:
   1. Carlisle Roofing Systems, Inc: www.carlisle-syntec.com/#sle.
   2. Johns Manville; JM EPDM: www.jm.com/#sle.
   3. Versico Roofing Systems; VersiGard EPDM: www.versico.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ROOFING - UNBALLASTED APPLICATIONS

A. Elastomeric Membrane Roofing: One ply membrane, mechanically fastened.

2.04 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

A. Membrane: Ethylene-propylene-diene-terpolymer (EPDM); non-reinforced; complying with minimum properties of ASTM D4637/D4637M, Type II (reinforced).
   1. Thickness: 0.060 inch (60 mil).
   2. Sheet Width: 120 inches, maximum; factory fabricate into widest possible sheets.
   3. Color: Black.
   4. Tensile Strength: 1600 psi, minimum, measured in accordance with ASTM D412.
   5. Ultimate Elongation: 465 percent, minimum, measured in accordance with ASTM D412.
   6. Tear Strength: 200 lbf per inch, measured in accordance with ASTM D624.
   7. Water Absorption: 2 percent increase in weight, maximum, measured in accordance with ASTM D570, 24 hour immersion.
   8. Water Vapor Permeability: 0.03 perm inch, measured in accordance with ASTM E96/E96M.
   9. Brittleness Temperature: -49 degrees F, measured in accordance with ASTM D746.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Membrane Fasteners: As recommended by and approved by membrane manufacturer.

D. Flexible Flashing Material: Same material as membrane; complying with the following:

2.05 DECK SHEATHING AND COVER BOARDS

A. Deck Sheathing: Fiber-reinforced gypsum roofing boards, ASTM C1278/C1278M, fire-resistant type, mold-resistant, 1/2 inch thick.

2.06 COVER BOARDS

A. Cover Boards: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
   1. Thickness: 1/2 inch, fire-resistant.

2.07 INSULATION

A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
   1. Classifications:
      a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
         1) Class 1 - Faced with glass fiber reinforced cellulosic facers on both major surfaces of the core foam.
         2) Compressive Strength: Classes 1-2-3, Grade 1 - 16 psi (110 kPa), minimum.
         3) Thermal Resistance, R-value: At 1-1/2 inches thick; Class 1, Grades 1-2-3 - 8.4 (1.48) at 75 degrees F.
   2. Board Size: 48 by 96 inches.
   3. Board Thickness: 5.6 inch.
   4. Tapered Board: Slope as indicated; minimum thickness 1/4 inch; fabricate of fewest layers possible.
   5. Board Edges: Square.
   6. Manufacturers:
      a. Membrane manufacturer or approved by manufacturer and covered under full system warranty.

2.08 VAPOR REDARDER

A. A. SBS Modified self-adhering vapor retarder, approved by roof manufacturer.
   1. Thickness: 31 mil.
   2. Roll Width: 69 inch.
   3. Water Vapor Permeance, Max.: 0.03 per ASTM E96.
   4. Air Permeability, Max.: 0.001 per ASTM E2178.

B. Available Manufacturers: Subject to compliance with requirements of drawings and specifications, materials from the following manufacturers may be provided:
   1. Same as roof manufacturers.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.09 ACCESSORIES

A. Walkway Pads: 1/8” thick, 24 inch by 24 inch walkway pads, Adhered directly to roofing membrane and spaced 3 inches apart.

B. Prefabricated Roofing Expansion Joint Flashing: See Section 07 71 00.

C. Prefabricated Roofing Expansion Joint Flashing: Sheet butyl over closed-cell foam backing seamed to galvanized steel flanges.

D. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

E. Cant and Edge Strips: Wood fiberboard, compatible with roofing materials; cants formed to 45 degree angle.

F. Membrane Adhesive: As recommended by membrane manufacturer.

G. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.

H. Surface Primer Over Roof Substrate for Adhesion of Membrane: Low VOC acrylic primer for application over roofing substrates.
   1. Color: White.
   2. Roof Membrane Substrate: Includes galvanized metal, plywood, concrete, aluminum with Kynar finish, EPDM, EIFS, or _____ as indicated on drawings.

I. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.

J. Roofing Nails: Galvanized, hot dipped type, size and configuration as required to suit application.

K. Sealants: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 PREPARATION - METAL DECK

A. Install deck sheathing on metal deck.
   1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
   2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
   3. Tape joints.

B. Mechanically fasten sheathing to roof deck, in accordance with Factory Mutual recommendations and roofing manufacturer's instructions.
   1. Over entire roof area, fasten sheathing using six fasteners with washers per sheathing board.

3.03 VAPOR RETARDER INSTALLATION

A. Install vapor retarder in accordance with manufacturer's instructions.

B. All work surfaces should be clean, dry, and free of dirt, dust, debris, oils, loose and/or embedded gravel, and other contaminants that may impair adhesion.
   1. Steel Deck: Install vapor retarder to new deck sheathing.

C. Roll out the vapor retarder over clean, dry deck and allow to relax. For metal decks, the width of the membrane is designed to match with the top of the flute.

D. Place vapor retarder in desired position. Once the membrane is in place, while holding the membrane tight, peel off the silicone release film by pulling diagonally from the underside of the sheet.

E. Install subsequent rolls of membrane in the same way, taking care to overlap the longitudinal side laps a minimum of 3” (76 mm) and end laps a minimum of 6” (152 mm).

F. For metal decks, at the end of the roll, install a metal plate 6” x 42” (152 mm x 1.07 m) to support the membrane end lap between the metal flutes ensuring a complete end lap seal. Overlap end laps a minimum of 6” (152 mm).

G. Once installed, pressure must be applied over the whole surface using a weighted roller to ensure adequate adhesion to the substrate.

H. Seal perimeter and penetration areas with closed-cell foam sealant. The vapor retarder must be tied into the building's air/vapor retarder system as appropriate with compatible SBS asphaltic materials.

I. Because the water resistance characteristics of vapor retarders can be compromised by storms, physical damage and installation issues, vapor retarders should be covered by a primary roof covering as soon as possible after installation. If the vapor retarder is not immediately covered, particular attention should be paid to implementation of details to ensure a temporary seal. All T-joints and 90 degree transitions must be sealed with flashing cement. If fishmouths or other openings are created at overlap, they must be sealed with flashing cement. All damage to or leaks through the vapor retarder must be repaired before installing the finished roof.

J. Vapor retarder has limitted UV resistance. Inall cases, full roof system must be installed over vapor retarder within the manufacturer's specified span of UV resistance.

3.04 INSULATION - UNDER MEMBRANE

A. Attachment of Insulation: Mechanically fasten insulation to deck in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.

B. Cover Boards: Mechanically fasten cover boards in accordance with roofing manufacturer's instructions.

C. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer.

D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

E. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.

F. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

G. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 24 inches.

H. Do not apply more insulation than can be covered with membrane in same day.

3.05 MEMBRANE APPLICATION

A. Install elastomeric membrane roofing system in accordance with manufacturer's recommendations and NRCA (WM) applicable requirements.

B. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

C. Shingle joints on sloped substrate in direction of drainage.

D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

E. Mechanical Attachment: Apply membrane and mechanical attachment devices in accordance with manufacturer's instructions.

F. At intersections with vertical surfaces:
   1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
   2. Fully adhere flexible flashing over membrane and up to nailing strips.

G. At gravel stops, extend membrane under gravel stop, over top of parapet, and to the outside face of the wall.

H. Around roof penetrations, seal flanges and flashings with flexible flashing.

I. Install roofing expansion joints where indicated. Make joints watertight.
   1. Install prefabricated joint components in accordance with manufacturer's instructions.

J. Coordinate installation of roof drains and sumps and related flashings.

3.06 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

C. Remove bituminous markings from finished surfaces.

D. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

E. Repair or replace defaced or damaged finishes caused by work of this section.

3.07 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

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SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, and downspouts.

B. Reglets and accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood nailers.

B. Section 07 71 00 - Roof Specialties: Manufactured roof specialties, including copings, fascias, and gravel stops.

C. Section 07 71 23 - Manufactured Gutters and Downspouts.

1.03 REFERENCE STANDARDS

A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2015.

B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2013.

C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

E. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Pre-Finished Aluminum: ASTM B209; Thickness as indicated below and as shown on the drawings.
   1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; pretreated metal with two-coat system including primer and color coat with at least 70 percent PVDF coating.
   2. Color: As selected by Architect from manufacturer's full colors.
   3. Thickness:
      a. Scuppers and Downspouts: 0.040 inch.

b. Miscellaneous Flashing and Counter Flashing: 0.032 inch.

B. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 24 gauge, 0.025 inch thick; smooth No. 4 - Brushed finish.
1. Locations as indicated below and as shown on the drawings.
a. Equipment Rail Caps.
b. Pre-Manufactured Pipe Flashings and Skirts.
c. Reglets & Counterflashings.

2.02 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Protective Backing Paint: Zinc molybdate alkyd.

D. Sealant: Type specified in Section 07 90 05.

E. Plastic Cement: ASTM D4586, Type I.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

2.04 GUTTER AND DOWNSPOUT FABRICATION

A. See Section 07 71 23 for manufactured gutters and downspouts.

B. Seal metal joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Conform to drawing details.

B. Insert flashings into reglets to form tight fit. Secure in place with lead wedges. Pack remaining spaces with lead wool. Seal flashings into reglets with sealant.

C. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

D. Apply plastic cement compound between metal flashings and felt flashings.

E. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

F. Seal metal joints watertight.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

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SECTION 07 71 00
ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured roof specialties, including copings, fascias, and gravel stops.

B. Roof control and expansion joint covers.

1.02 RELATED REQUIREMENTS

A. Section 07 54 00 - Thermoplastic Membrane Roofing.

B. Section 07 72 00 - Roof Accessories: Manufactured curbs.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.

B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.

C. NRCA (RM) - The NRCA Roofing Manual; 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements.

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

1.05 WARRANTY

A. **Products shall be included in Full System Warranty of roof system.**

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Roof Edge Flashings and Copings: Subject to requirements of the drawings and specifications, products from the following manufacturers may be provided. **(Products shall be approved by roof system manufacturer as part of Full System Warranty)**:

1. Architectural Products Co: www.archprod.com/#sle.
2. ATAS International, Inc: www.atas.com/#sle.
3. Drexel Metals Inc: www.drexmet.com/#sle.
4. Metal-Era Inc: www.metalera.com/#sle.
5. Metal Roofing Systems, Inc; Rapid Lock Coping: www.metalroofingsystems.biz/#sle.
6. OMG Roofing Products; Formed Coping Plus: www.omgroofing.com/#sle.
7. Substitutions: See Section 01 60 00 - Product Requirements.

B. **Products that are not covered under the roofing manufacturer's Total System, Edge-to-Edge warranty are not compliant with requirements of the specifications.**

2.02 COMPONENTS

A. Roof Edge Flashings: Factory fabricated to sizes required; corners mitered; concealed fasteners.

1. Configuration: Fascia, cant, and edge securement for roof membrane of configuration indicated on the drawings.
2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
3. Exposed Face Height: As indicated on drawings. All dimensions to be field verified prior to fabrication.

4. Material: Formed aluminum sheet, 0.050 inch thick, minimum.
5. Finish: 70 percent polyvinylidene fluoride.
6. Color: As selected by Architect from manufacturer's full range.

B. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
3. Configuration: As indicated on drawings. All dimensions to be field verified prior to fabrication.
4. Material: Formed aluminum sheet, 0.050 inch thick, minimum.
5. Finish: 70 percent polyvinylidene fluoride.
6. Color: As selected by Architect from manufacturer's full range.

C. Control and Expansion Joint Covers: Composite construction of 4 inch wide flexible EPDM flashing of black color with closed cell urethane foam backing, each edge seamed to aluminum sheet metal flanges, designed for nominal joint width of 1 inch. Include special formed corners, tees, intersections, and wall flashings, each sealed watertight.

D. Pipe and Penetration Flashing: Base of rounded aluminum, compatible with sheet metal roof systems, and capable of accomodating pipes sized between 3/8 inch and 12 inches.
1. Caps: EPDM.
2. Color: As indicated on drawings.

E. Roof Penetration Sealing Systems: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.

F. Counterflashings: Factory fabricated and finished sheet metal that overlaps top edges of base flashing by at least 4 inches, and designed to snap into through-wall flashing or reglets with lapped joints.
1. Material: Stainless steel sheet, 24 gauge, 0.025 inch thick, minimum.
2. Finish: Bright finish.
3. Color: To be selected by Architect from manufacturer's standard range.

2.03 FINISHES

A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.04 ACCESSORIES

A. Sealant for Joints in Linear Components: As recommended by component manufacturer.

B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Seal joints within components when required by component manufacturer.

C. Anchor components securely.

D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

E. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

F. Coordinate installation of flashing flanges into reglets.

END OF SECTION

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SECTION 07 71 23
MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-finished aluminum scupper boxes, gutters and downspouts.

B. Precast concrete splash pads.

1.02 RELATED REQUIREMENTS

A. Section 07 61 00 - Sheet Metal Roofing.

B. Section 07 62 00 - Sheet Metal Flashing and Trim.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.

B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021.

C. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

B. Comply with applicable code for size and method of rain water discharge.

C. Maintain one copy of each document on site.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on prefabricated components.

C. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

C. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gutters and Downspouts:
   1. ATAS International, Inc: www.atas.com/#sle.
   2. Hickman Edge Systems: www.hickmanedgesystems.com/#sle.
   3. Metal-Era Inc; Seal-Tite WR Gutter: www.metalera.com/#sle.
   4. SAF Perimeter Systems, a division of Southern Aluminum Finishing Company, Inc: www.saf.com/persys/#sle.
   5. Metal-Era: www.metalera.com.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Scupper and Collectors:
   1. ATAS International, Inc: www.atas.com/#sle.
   2. Pac-Clad: www.pac-clad.com/.
   3. Metal-Era: www.metalera.com..
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Pre-Finished Aluminum Sheet: ASTM B209/B209M; 0.040 inch thick.
   1. Finish: Smooth, shop pre-coated with polyvinylidene fluoride (PVDF) coating.
   2. Color: As selected from manufacturer's standard colors.

B. Protective Backing Paint: Zinc molybdate alkyd.

2.03 GUTTERS

A. Gutter:
   1. Profile: Rectangular.
   2. Material: 0.040" aluminum.
   3. Gutter Size:
      a. Face: 6”
      b. Depth: 6"
   4. Formed Lengths: Continuous.
   5. Fastener Holes: Pre-punched.
   6. Internal Brackets: 2-piece adjustable size.
      a. Material: Extruded Aluminum.
      b. Finish: Same as gutters.
      c. Width: 1”.
      d. Spacing: 24” O.C.
   7. Concealed Splice Plates
      a. Material: Same as gutters.
      b. Finish and Color: Same as gutters.
      c. Width: 6”.
   8. Basis of Design: Pac-Tite LT Gutter K-Style by Pac-Clad.

B. Factory-Fabricated Accessories: Quicklock.
   1. Miters.
   2. End caps.
   3. Expansion joints.
   4. Special corners.
   5. Material, Finish, and Color: Same as gutters.

2.04 DOWNSPOUTS

A. Downspouts: Rectangular.
   1. Dimensions: 3" x 5".
   2. Material: 0.040” aluminum.
   3. Formed Lengths: 12’-0”.
   4. Seams: Double Seam Lock.
   5. Attachment Straps:
      a. Width: 2”.
      b. Straps per 12-Foot Downspout Length: 3.
   6. Standard Elbows:
      a. Material: Match downspouts.
      b. Finish: Match downspouts.
      c. Color: Match downspouts.
   7. Offset Elbows: Wall and Eave conditions.
      a. Material: 0.050” aluminum.
      b. Finish: Match downspouts.
      c. Color: Match downspouts.
   8. Outlets: 0.040” aluminum.
   9. Downspout Transitions:
      a. Material: Match downspouts.
      b. Finish: Match downspouts.

c. Color: Match downspouts.
d. Seams: Quicklock.

10. Basis of Design: Metal-Era.

2.05 SCUPPERS AND CONDUCTOR HEADS

A. Thru-Wall Scuppers: Welded, dropped conductor head, style 3.
1. Material: 0.063” aluminum
2. Picture Frames: Front, 2” wide; back, 3” wide.

B. Basis of Design: Metal-Era.

2.06 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; seal watertight.

2.07 FINISHES

A. Fluoropolymer Coating: Superior Performance Organic Finish, AAMA 2605, multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.08 ACCESSORIES

A. Splash Pads: Precast concrete type, profiles size(s) as indicated; minimum 3,000 psi compressive strength at 28 days, with minimum 5 percent air entrainment.
1. 36" long x 11-1/2" wide x 2-3/4" high.
2. Basis of Design: Nitterhouse Masonry Products, LLC.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify surfaces to support gutters are clean, dry, secure, and of proper dimensions.

C. Verify roof edge is level and wood nailers are straight.

D. Notify Architect of conditions that would adversely affect installation.

E. Do not begin installation until unacceptable conditions are corrected.

3.02 PREPARATION

A. Paint concealed sheet metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Install products to allow water to drain from edge of roof.

C. Install products to allow for thermal movement.

D. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.

E. Slope gutters 1/16" inch per foot.

F. Joint Sealants: Apply joint sealants in accordance with manufacturer’s instructions.

G. Review lengths of straight pieces before cutting to avoid creating relatively short sections adjacent to full-length sections.

H. Isolate products from ACQ treated wood blocking or other galvanically incompatible material with appropriate membrane material.

I. Set splash pads under downspouts.
   1. Compact grade below downspout to 95% and slope away from building.
   2. Place 4 inches of crushed stone over geotextile filter fabric on compact grade. Finish top of stone to 1" above adjacent grade and slope away from building.
   3. Sed splash pad on crushed stone, under downspout.

3.04 CLEANING

A. Clean products promptly after installation in accordance with manufacturer's instructions.

B. Remove clear protective vinyl film.

C. Do not use harsh cleaning materials or methods that could damage finish.

3.05 PROTECTION

A. Protect installed products to ensure that, except for normal weathering, products will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof penetrations mounting curbs.

B. Rooftop mounted guardrails.

C. Roof hatches and guardrail assemblies.

D. Non-penetrating pedestals.

1.02 RELATED REQUIREMENTS

A. Section 07 71 00 - Roof Specialties: Other manufactured roof specialty items.

1.03 REFERENCE STANDARDS

A. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices; Current Edition.

B. 29 CFR 1926.502 - Fall protection systems criteria and practices; Current Edition.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

F. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.

D. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURED CURBS

A. Roof Curbs Manufacturers:
   1. AES Industries Inc: www.aescurb.com/#sle.
   2. The Pate Company: www.patecurbs.com/#sle.
   3. LMCurbs; Roof Curbs: www.lmcurbs.com/#sle.
   4. MKT Metal Manufacturing: www.mktduct.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Roof Curbs: Factory fabricated hollow sheet metal construction, internally insulated and reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
   1. Roof Curb Mounting Substrate: Curb substrate consists of corrugated metal roof deck with insulation.
   2. Sheet Metal Material:
      a. Aluminum: 0.080 inch minimum thickness, with 3003 alloy, and H14 temper.
         1) Finish: Mill finish.
         2) Color: As selected by Architect from manufacturer's standard line of colors.
   3. Galvanized Steel: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33; G60 coating designation; 18 gage, 0.048 inch thick.
      a. Finish: Factory primed.
      b. Color: As selected by Architect from manufacturer's standard line of colors.
   4. Galvalume Steel: Hot-dip aluminum zinc alloy coated steel sheet complying with ASTM A792/A792M; AZ55 coating designation; 18 gage, 0.048 inch thick.
      a. Finish: Factory primed.
      b. Color: As selected by Architect from manufacturer's standard line of colors.
   5. Provide layouts and configurations as required for equipment.

2.02 ROOFTOP MOUNTED GUARDRAILS

A. Basis of Design: Rail Guard 200 by Garlock Safety Systems.

B. Manufacturers:
   1. Safety Rail Company; SRC360 Mobile Safety Rail System: www.safetyrailcompany.com/#sle.
   2. A/E Approved Equivalent.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

C. Non-Penetrating Rooftop Mounted Guardrails:
   1. Provide top and mid railings that comply with 29 CFR 1910.29.
   2. Structural Load: 200 lb, minimum, in any direction with components in compliance with 29 CFR 1926.502.
   3. Height: 42 inches, minimum.
   4. Railings: 1-5/8 inches minimum outside diameter, hot-rolled, welded tubing, free of sharp edges and snag points.
   5. Steel Surface Finish: Hot-dip zinc galvanized, with color of safety yellow.

2.03 ROOF HATCHES

A. Manufacturers - Sound Rated Roof Hatches:
   1. Babcock-Davis: www.babcockdavis.com/#sle.
   2. Bilco Company: www.bilco.com/#sle.
   3. LMCurbs: www.lmcurbs.com/#sle.
   4. Nystrom, Inc.: www.nystrom.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Roof Hatch:
   1. Basis of Design: Babcock-Davis; Personnel, BG3072.

2. Clear Opening: 30" wide z 72" long.
3. Curb Height: 18".
4. Door Configuration: Side Opening.
5. Cover & Curb Material: Painted, galvanized Steel.
6. Insulation: 2 inch polyisocyanurate.

C. Safety Railing System: Manufacturer's standard accessory safety rail system mounted directly to curb.
1. Self-Closing Gate: Comply with 29 CFR 1910.29 for safe egress and fall protection through hatch opening.
2. Posts and Rails: Aluminum tube.
3. Gate: Same material as railing; automatic closing with latch.
4. Finish: MIll finish.
5. Gate Hinges and Post Guides: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper aluminum.
6. Mounting Brackets: Hot dipped galvanized steel, 1/4 inch thick, minimum.
7. Manufacturers:
   a. Babcock-Davis.

D. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.
2. Hinges: Heavy duty pintle type.
3. Hold open arm with vinyl-coated handle for manual release.
4. Latch: Upon closing, engage latch automatically and reset manual release.
5. Manual Release: Pull handle on interior.
6. Locking: Padlock hasp on interior.

2.04 NON-PENETRATING ROOFTOP ASSEMBLIES

A. Non-Penetrating Rooftop Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly.
1. Design Loadings and Configurations: As required by applicable codes.
2. Height: Provide minimum clearance of 8 inches under supported items to top of roofing.
3. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
4. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
5. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

B. Non-Penetrating Pedestals: Steel pedestals with square, round, or rectangular bases.
1. Bases: High density polypropylene.
2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
3. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
4. Manufacturers:
   a. Portals Plus; Pedestal Plus
   b. Approved Equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing weather integrity.

3.04 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean installed work to like-new condition.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire-resistance rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 01 70 00 - Execution and Closeout Requirements: Cutting and patching.

B. Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015 (Reapproved 2019).

D. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2013 (Reapproved 2017).

E. ITS (DIR) - Directory of Listed Products; current edition.

F. FM 4991 - Approval Standard for Firestop Contractors; 2013.

G. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

H. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

I. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

J. UL (FRD) - Fire Resistance Directory; current edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Certificate from authority having jurisdiction indicating approval of materials used.

G. Qualification statements for installing mechanics.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in the current-year classification or certification books of UL, FM, or ITS (Warnock Hersey) will be considered as constituting an acceptable test report.
   2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
   3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Approved by Factory Mutual Research under FM Standard 4991, Approval of Firestop Contractors, or meeting any two of the following requirements:.
   2. With minimum 5 years documented experience installing work of this type.
   3. Able to show at least 3 satisfactorily completed projects of comparable size and type.
   4. Licensed by authority having jurisdiction.
   5. Approved by firestopping manufacturer.

D. Installing Mechanic's Qualifications: Trained by firestopping manufacturer and able to provide evidence thereof.

1.06 MOCK-UP

A. Install one firestopping assembly representative of each fire rating design required on project.
   1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
   2. Where firestopping is intended to fill a linear opening, install minimum of 2 linear ft.

B. Obtain approval of authority having jurisdiction before proceeding.

C. If accepted, mock-up will represent minimum standard for the Work.

D. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.07 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 FIRESTOPPING - GENERAL REQUIREMENTS

A. Manufacturers:
   1. A/D Fire Protection Systems Inc: www.adfire.com.
   2. 3M Fire Protection Products: www.3m.com/firestop.
   3. Hilti, Inc: www.us.hilti.com.
   4. Nelson FireStop Products: www.nelsonfirestop.com.

B. Firestopping Materials with Volatile Content: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Head-of-Wall Firestopping at Joints Between Non-Rated Floor and Fire-Rated Wall: Use any system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
   1. Movement: In addition, provide systems that have been tested to show movement capability as indicated.

B. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use any system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
   1. Movement: In addition, provide systems that have been tested to show movement capability as indicated.

2. Air Leakage: In addition, provide systems that have been tested to show L Rating as indicated.
3. Watertightness: In addition, provide systems that have been tested to show W Rating as indicated.
4. Listing by UL, FM, or Intertek in their certification directory will be considered evidence of successful testing.

C. Through Penetration Firestopping: Use any system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
1. Temperature Rise: In addition, provide systems that have been tested to show T Rating as indicated.
2. Air Leakage: In addition, provide systems that have been tested to show L Rating as indicated.
3. Listing by UL, FM, or Intertek in their certification directory will be considered evidence of successful testing.

2.03 FIRESTOPPING FOR FLOOR-TO-FLOOR, WALL-TO-FLOOR, AND WALL-TO-WALL JOINTS

A. Concrete and Concrete Masonry Walls and Floors:
1. Top of Wall Joints at Concrete/Concrete Masonry Wall to Concrete Over Metal Deck Floor:
a. 2 Hour Construction: UL System HW-D-0181; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
b. 2 Hour Construction: UL System HW-D-1037; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
2. Concrete/Concrete Masonry Wall to Wall Joints:
a. 2 Hour Construction: UL System WW-D-0017; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
b. 2 Hour Construction: UL System WW-D-0032; Hilti CP 606 Flexible Firestop Sealant.

B. Gypsum Board Walls:
1. Wall to Wall Joints:
a. 2 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.
b. 1 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.

2.04 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

A. Blank Openings:
1. In Walls:
a. 2 Hour Construction: UL System C-AJ-0090; Hilti FS-ONE Intumescent Firestop Sealant.

B. Penetrations Through Walls By:
1. Multiple Penetrations in Large Openings:
a. 2 Hour Construction: UL System C-AJ-8143; Hilti FS-ONE Intumescent Firestop Sealant.
2. Uninsulated Metallic Pipe, Conduit, and Tubing:
a. 2 Hour Construction: UL System C-AJ-1421; Hilti FS-ONE Intumescent Firestop Sealant or CP 604 Self-Leveling Firestop Sealant.
b. 2 Hour Construction: UL System C-AJ-1498; Hilti CP 680-P/M Cast-In Device.
3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
a. 2 Hour Construction: UL System C-AJ-2109; Hilti CP 643N/644 Firestop Collar.
b. 2 Hour Construction: UL System C-BJ-2021; Hilti CP 643N Firestop Collar.
4. Electrical Cables Not In Conduit:
a. 2 Hour Construction: UL System C-AJ-3216; Hilti CP 658 Firestop Plug.
b. 2 Hour Construction: UL System W-J-3198; Hilti CFS-SL RK Retrofit Sleeve Kit for existing cables.
c. 2 Hour Construction: UL System W-J-3199; Hilti CFS-SL SK Firestop Sleeve Kit.

5. Cable Trays with Electrical Cables:
   a. 3 Hour Construction: UL System C-AJ-4035; Hilti FS-ONE Intumescent Firestop Sealant.
6. Insulated Pipes:
   a. 2 Hour Construction: UL System C-AJ-5048; Hilti FS-ONE Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CP 601S Elastomeric Firestop Sealant, or CP 604 Self-Leveling Firestop Sealant.
7. HVAC Ducts, Uninsulated:
   a. 2 Hour Construction: UL System C-AJ-7111; Hilti FS-ONE Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System C-AJ-7084; Hilti FS-ONE Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CP 601S Elastomeric Firestop Sealant, or CP 604 Self-Leveling Firestop Sealant.

C. Penetrations Through Walls By:
1. Uninsulated Metallic Pipe, Conduit, and Tubing:
   a. 2 Hour Construction: UL System W-J-1067; Hilti FS-ONE Intumescent Firestop Sealant.
2. Electrical Cables Not In Conduit:
   a. 2 Hour Construction: UL System W-J-3060; Hilti FS-ONE Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
   b. 2 Hour Construction: UL System W-J-3143; Hilti CP 658T Firestop Plug.
3. Insulated Pipes:
   a. 2 Hour Construction: UL System W-J-5041; Hilti FS-ONE Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System W-J-5042; Hilti FS-ONE Intumescent Firestop Sealant.
   c. 2 Hour Construction: UL System W-J-5028; Hilti FS-ONE Intumescent Firestop Sealant.
4. HVAC Ducts, Uninsulated:
   a. 2 Hour Construction: UL System W-J-7109; Hilti FS-ONE Intumescent Firestop Sealant or CP 606 Flexible Firestop Sealant.
5. HVAC Ducts, Insulated:
   a. 2 Hour Construction: UL System W-J-7112; Hilti FS-ONE Intumescent Firestop Sealant.

2.05 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

A. Blank Openings:
1. 2 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.

B. Penetrations By:
1. Multiple Penetrations in Large Openings:
   a. 2 Hour Construction: UL System W-L-1389; Hilti FS-ONE Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System W-L-1408; Hilti FS-ONE Intumescent Firestop Sealant.
   c. 2 Hour Construction: UL System W-L-8071; Hilti FS-ONE Intumescent Firestop Sealant.
   d. 2 Hour Construction: UL System W-L-8079; Hilti FS-ONE Intumescent Firestop Sealant.
   e. 2 Hour Construction: UL System W-L-8087; Hilti FS 657 Fire Block.
2. Uninsulated Metallic Pipe, Conduit, and Tubing:
   a. 2 Hour Construction: UL System W-L-1054; Hilti FS-ONE Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System W-L-1164; Hilti FS-ONE Intumescent Firestop Sealant.

c. 2 Hour Construction: UL System W-L-1206; Hilti FS-ONE Intumescent Firestop Sealant.

3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
   a. 2 Hour Construction: UL System W-L-2078; Hilti CP 643N/644 Firestop Collar.
   b. 2 Hour Construction: UL System W-L-2411; Hilti CP 648-E Firestop Wrap Strip.
   c. 2 Hour Construction: UL System W-L-2128; Hilti FS-ONE Intumescent Firestop Sealant.
4. Electrical Cables Not In Conduit:
   a. 2 Hour Construction: UL System W-L-3065; Hilti FS-ONE Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
   b. 2 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
   c. 2 Hour Construction: UL System W-L-3393; Hilti CFS-SL RK Retrofit Sleeve Kit for existing cables.
   d. 2 Hour Construction: UL System W-L-3394; Hilti CFS-SL SK Firestop Sleeve Kit.
   e. 2 Hour Construction: UL System W-L-3395; Hilti CP653 Speed Sleeve.
5. Cable Trays with Electrical Cables:
   a. 2 Hour Construction: UL System W-L-4011; Hilti FS 657 Fire Block.
   b. 2 Hour Construction: UL System W-L-4060; Hilti FS-ONE Intumescent Firestop Sealant.
6. Insulated Pipes:
   a. 2 Hour Construction: UL System W-L-5028; Hilti FS-ONE Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System W-L-5029; Hilti FS-ONE Intumescent Firestop Sealant.
   c. 2 Hour Construction: UL System W-L-5096; Hilti FS-ONE Intumescent Firestop Sealant.
   d. 2 Hour Construction: UL System W-L-5257; Hilti FS-ONE Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, or CP 601S Elastomeric Firestop Sealant.
   e. 2 Hour Construction: UL System W-L-5244; Hilti CP 648-E Firestop Wrap Strip.
7. HVAC Ducts, Insulated:
   a. 2 Hour Construction: UL System W-L-7156; Hilti FS-ONE Intumescent Firestop Sealant.

2.06 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements. Foam, caulk, putty or manufactured device.
   1. Fire Ratings: Use any system listed by UL, FM, or ITS (Warnock Hersey) or that has F Rating equal to fire rating of penetrated assembly and minimum T Rating of 0 and that meets all other specified requirements.
   2. Fire Ratings: See Drawings for required systems and ratings.

B. Firestopping at Uninsulated Metallic Pipe and Conduit Penetrations, of diameter 4 inches or less: Any material meeting requirements. Foam, caulk, putty or manufactured device.

C. Firestopping at Cable Tray Penetrations: Any material meeting requirements. Foam, caulk, putty or manufactured device.

D. Firestopping at Cable Penetrations, not in Conduit or Cable Tray: Any material meeting requirements. Foam, caulk, putty or manufactured device.

E. Firestopping at Control and Expansion Joints (without Penetrations): Any material meeting requirements and caulk.

2.07 MATERIALS

A. Firestopping Sealants: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

B. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.

C. Foam Firestoppping: Single component silicone foam compound.

D. Fibered Compound Firestopping: Formulated compound mixed with incombustible non-asbestos fibers.

E. Fiber Firestopping: Mineral fiber insulation used in conjunction with elastomeric surface sealer forming airtight bond to opening.

F. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to arrest liquid material leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authority having jurisdiction.

C. Install labeling required by code.

CLEANING

4.01 CLEAN ADJACENT SURFACES OF FIRESTOPPING MATERIALS.

4.02 PROTECTION

A. Clean adjacent surfaces of firestopping materials.

B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.

E. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements and Section 01 33 00 - Submittal Procedures, for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Backing material recommended by sealant manufacturer.
   4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   5. Substrates the product should not be used on.
   6. Substrates for which use of primer is required.
   7. Substrates for which laboratory adhesion and/or compatibility testing is required.
   8. Installation instructions, including precautions, limitations, and recommended backing materials and tools.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Initial Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Executed warranty.

1.04 MOCK-UP

A. Products of this section are to be included in full exterior wall construction mock-up panel as indicated on the drawings.
   1. Wall construction mock-up shall be utilized be utilized to confirm material and color selections.
   2. Wall construction mock-up shall demonstrate construction detail and quality and shall serve as benchmark for construction.
   3. Wall construction mock-up shall remain in place throughout construction of the building envelope and shall only be removed upon direction from the A/E.
   4. Locate mock-up where directed by Architect/Engineer.

B. Products of this section are to be included in metal panel roof mock-up.

C. Prepare on-site mock-ups for each sealant type and application not included in the mock-ups indicated above for confirmation of initial color selections. Mock-ups shall include up to four colors for each sealant type and substrate type.

D. Approved mock-up may remain as part of the part of the work.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least five years of documented experience.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nonsag Sealants:
1. Bostik Inc: www.bostik-us.com/#sle.
2. Dow: www.dow.com/#sle.
3. Henry Company: www.henry.com/#sle.
4. Hilti, Inc: www.hilti.com/#sle.
5. Pecora Corporation: www.pecora.com/#sle.
6. Sika Corporation: www.usa.sika.com/#sle.
7. Specified Technologies Inc: www.stifirestop.com/#sle.
8. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
9. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
10. Substitutions: See Section 01 60 00 - Product Requirements.

B. Self-Leveling Sealants:
1. Bostik Inc: www.bostik-us.com/#sle.
2. Dow: www.dow.com/#sle.
3. Pecora Corporation: www.pecora.com/#sle.
4. Sika Corporation: www.usa.sika.com/#sle.
5. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
6. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
1. Exterior Joints:
   a. Seal the following joints:
      1) Wall expansion and control joints.
      2) Joints between doors, windows, and other frames or adjacent construction.
      3) Joints between different exposed materials.
      4) Joints between paving and building foundation or slab.
      5) Control joints and expansion joints in concrete paving and curbs.
2. Interior Joints:
   a. Seal the following joints:
      1) Joints between door frames and window frames and adjacent construction.
      2) In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, and piping penetrations.

3) In sound-rated wall and ceiling assemblies, seal joints between wall assemblies and ceiling assemblies; between wall assemblies and other construction; between ceiling assemblies and other construction.

B. Exterior Joints:
1. Type EX-1 - Exterior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
2. Type EX-2 - Lap Joints between Manufactured Metal Panels: Butyl rubber, noncuring.
3. Type EX-3 - Control Joints and Expansion Joints in Concrete Paving: Self-leveling polyurethane traffic-grade sealant.

C. Interior Joints:
1. Type INT-1 - Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
2. Type INT-2 - Control Joints and Expansion Joints in Concrete Floor Slab: Nonsag polyurethane non-traffic-grade sealant suitable for continuous liquid immersion.
3. Type INT-3A - Joints between Tile in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
4. Type INT-3B - Joints between Porcelain Fixtures and Floors and Walls: Mildew-resistant silicone sealant; Clear.
5. Type INT-3B - Joints between Casework and wall and Between Backsplash and Countertop: Mildew-resistant silicone sealant; clear.

2.03 JOINT SEALANTS - GENERAL

2.04 NONSAG JOINT SEALANTS

A. Type INT-3A - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: White.
2. Basis-of-Design: Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com/#sle.
3. Available Products: Subject to requirements of drawings and specifications, products from manufacturers listed in paragraph 2.01 may be provided.

B. Type INT-3B - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: Clear.
2. Basis-of-Design: Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com/#sle.
3. Available Products: Subject to requirements of drawings and specifications, products from manufacturers listed in paragraph 2.01 may be provided.

C. Type EXT-1 and Type INT-1 - Polyurethane Sealant: ASTM C920, Grade NS, Uses M, A, G and O; multi-component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum, when tested in accordance with ASTM C719.
2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's full range and confirmed by mock-up.
4. Basis-of-Design: Pecora Corporation; DynaTrol II: www.pecora.com/#sle.
5. Available Products: Subject to requirements of drawings and specifications, products from manufacturers listed in paragraph 2.01 may be provided.

D. Type EX-2 - Noncuring Butyl Sealant: Solvent-based, single component, nonsag, nonskinning, nonhardening, nonbleeding; nonvapor permeable; intended for fully concealed applications.
1. Basis-of-Design: Pecora BA-98 Non-Skinning Bytyl Sealant.
2. Available Products: Subject to requirements of drawings and specifications, products from manufacturers listed in paragraph 2.01 may be provided.

2.05 SELF-LEVELING JOINT SEALANTS

A. Type EX-3 and Type INT-2 - Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M, A and G; single component; explicitly approved by manufacturer for traffic exposure and continuous water immersion.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's full range.
   4. Service Temperature Range: Minus 40 to 180 degrees F.
   5. Basis-of-Design: Sikaflex-1c SL: www.usa.sika.com/#sle.
   6. Available Products: Subject to requirements of drawings and specifications, products from manufacturers listed in paragraph 2.01 may be provided.

2.06 ACCESSORIES

A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.

B. Sealant Backing Rod, Closed-Cell Type:
   1. Cylindrical flexible sealant backings complying with ASTM C1330 Type C.
   2. Size: 25 to 50 percent larger in diameter than joint width.

C. Preformed Joint Filler: Closed-cell polyethylene foam expansion and isolation joint filler for use in concrete construction with integrated tear-off strip at top edge to create void for installation of cold-applied sealant. ASTM D7174, Type-1. ASTM D5249, Type-2.
   1. Density: <2.0 lb.cu.ft., when tested in accordance with ASTM D545.
   2. Comparison Recovery from 50% Compression: > 95% when tested in accordance with ASTM D7174 and ASTM D545.
   3. Water Absorption: <0.5% when tested in accordance with ASTM D545.
   4. Basis-of-Design: Momaco, Fastflex: www.nomaco.com/#sle.

D. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

E. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

F. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

G. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Install acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

END OF SECTION

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SECTION 08 06 71

DOOR HARDWARE SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section references specification sections relating to commercial door hardware for the following:

1. Swinging doors.
2. Sliding Doors.
3. Other doors to the extent indicated.

B. Commercial door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical and access control door hardware.
3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
4. Automatic operators.
5. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Interior Sliding Wood Sound Control Door Assemblies”.
2. Division 08 Section “Door Hardware”.
3. Division 28 Section “Access Control Hardware Devices”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.5 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.6 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Refer to “PART 3 – EXECUTION” for required specification sections.

PART 3 - EXECUTION

3.1 DOOR HARDWARE SETS

A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.

2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.

1. Section 08 34 73 – Interior Sliding Wood Sound Control Door Assemblies.
2. Section 08 71 00 – Door Hardware.
3. Section 28 15 00 – Access Control Hardware Devices.

C. Manufacturer's Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. SA - SARGENT
4. SU - Securitron
5. RO - Rockwood
6. AD - Adams Rite
7. SR - Securitech
8. RS - RITE Slide
9. HS - HES
10. RF - Rixson
11. NO - Norton
12. OT - Other
13. MC - Medeco
14. AK - Alarm Controls

Hardware Sets

Set: 1.0A

Doors: V01A, V01D

2 Mortise Cylinder	60 42	US32D	SA	087100
1 Core	6300	US15	SA	087100

Notes: Remainder of hardware by door manufacturer.
Electronic Operation: Motion detector allows free egress at all times. Request to exit button allows free egress at all times. Doors are push to enable breakaway in event of emergency. Card reader engages automatic operator allowing entry. Entry by motion detector when exterior access is enabled by remote station or timer. Emergency entry by key.

Set: 1.0B

Doors: V01B, V01C

2 Mortise Cylinder	60 42	US32D	SA	087100
2 Core	6300	US15	SA	087100
1 Card Reader	BY SECURITY		OT	

Notes: Remainder of hardware by door manufacturer.
Electronic Operation: Motion detector allows free egress at all times. Request to exit button allows free egress at all times. Doors are push to enable breakaway in event of emergency. Card reader engages automatic operator allowing entry. Entry by motion detector when exterior access is enabled by remote station or timer. Emergency entry by key.

Set: 2.0A

Doors: 157.1, 174.1

2	Continuous Hinge	CFM__SLI-HD1 SER12 - DOOR HT		PE	087100	⚡
1	Concealed Vert Rod Exit, Exit Only	55 MDPE8610 EO	US32D	SA	087100	
1	Concealed Vert Rod Exit	56-SN200-MDPE8610 P106 x 862	US32D	SA	281500	⚡
1	Core	6300	US15	SA	087100	
2	Conc Overhead Stop	6-X36	630	RF	087100	
2	Surface Closer	J7500 (brackets and drop plate as req'd)	689	NO	087100	
2	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1	Astragal	S771BL LAR		PE	087100	
1	Gasketing	S88BL (Head & Jambs)		PE	087100	
1	Rain Guard	346C		PE	087100	
2	Sweep	3452CNB		PE	087100	
1	Threshold	272A MSES25SS		PE	087100	
3	Door Harness	QC-C___ - LENGTH TO SUIT		MK	087100	⚡
2	Frame Harness	QC-C1500P		MK	087100	⚡
2	Door Contact Switch	BY SECURITY - PREP DOOR/FRAME		OT		
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: Perimeter/meeting stile seals by frame/door supplier.
Electronic Operation: Valid card or key retracts latchbolt. Free egress at all times. Exit device at active leaf and inactive leaf retracts latch bolt allowing free egress at all times. In case of power loss, door remains locked and latched.

Set: 2.0B

Doors: 155.1

2	Continuous Hinge	CFM__SLI-HD1 SER12 - DOOR HEIGHT		PE	087100	⚡
1	Concealed Vert Rod Exit, Exit Only	55 ADPE8610 EO	US32D	SA	087100	
1	Concealed Vert Rod Exit	64 56-SN200-ADPE8610 P106 x 862	US32D	SA	281500	⚡
1	Core	6300	US15	SA	087100	
2	Conc Overhead Stop	6-X36	630	RF	087100	
2	Surface Closer	J7500 (brackets and drop plate as req'd)	689	NO	087100	
2	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1	Weatherstrip	BY DOOR SUPPLIER		OT		
1	Rain Guard	346C		PE	087100	
2	Sweep	3452CNB		PE	087100	
1	Threshold	272A MSES25SS		PE	087100	
2	Door Harness	QC-C___ - LENGTH TO SUIT		MK	087100	⚡
2	Frame Harness	QC-C1500P		MK	087100	⚡
2	Door Contact Switch	BY SECURITY - PREP DOOR/FRAME		OT		
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: Perimeter/meeting stile seals by frame/door supplier.
Electronic Operation: Valid card or key retracts latchbolt. Free egress at all times. Exit device at active leaf and inactive leaf retracts latch bolt allowing free egress at all times. In case of power loss, door remains locked and latched.

Set: 3.0

Doors: CY1A, CY1B, CY2A, CY2B, CY3A, CY3B, CY3C

1	Continuous Hinge	CFM__SLI-HD1 SER12 - DOOR HEIGHT		PE	087100	⚡
1	Continuous Hinge	CFM__SLI-HD1 - DOOR HEIGHT		PE	087100	
1	Fail Secure Exit Device	64 16 MDPE8874-24v WEL SPAR NE-E35 (weep holes CPC)	US32D	SA	087100	⚡
1	Rim Exit Device, Dummy	63 16 PE8610 P106 SPAR NE-E35 (weep holes CPC)	US32D	SA	087100	
3	Core	6300	US15	SA	087100	
2	Conc Overhead Stop	6-X36	630	RF	087100	
2	Surface Closer	7500 (brackets and drop plate as req'd)	689	NO	087100	
2	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1	Wiring Diagram	WD-SYSPK (Elevations and Point to Point)		SA	087100	
1	Astragal	297AS		PE	087100	
1	Gasketing	S88BL (Head & Jambs)		PE	087100	
2	Sweep	307APK		PE	087100	
1	Threshold	272A MSES25SS		PE	087100	
1	Door Harness	QC-C___ - LENGTH TO SUIT		MK	087100	⚡
1	Frame Harness	QC-C1500P		MK	087100	⚡
1	Card Reader	BY SECURITY		OT		
2	Door Contact Switch	BY SECURITY - PREP DOOR/FRAME		OT		
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: Operation: Card reader unlocks trim at active leaf allowing access. Exit device at active leaf and inactive leaf retracts latch bolt allowing free egress at all times. Key outside unlocks trim at both leaves.

Set: 4.0

Doors: CY2C

1	Continuous Hinge	CFM__SLI-HD1 SER12 - DOOR HT		PE	087100	⚡
1	Access Control Mort Lock	63 SN200-82271-24V LNL	US26D	SA	281500	⚡
1	Core	6300	US15	SA	087100	
1	Conc Overhead Stop	6-X36	630	RF	087100	
1	Surface Closer	7500 (brackets and drop plate as req'd)	689	NO	087100	
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1	Astragal	297AS		PE	087100	
1	Gasketing	S88BL (Head & Jambs)		PE	087100	
1	Sweep	307APK		PE	087100	
1	Threshold	272A MSES25SS		PE	087100	
1	ElectroLynx Harness (frame)	QC-C1500P		MK	087100	⚡
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Req'd)		MK	087100	⚡
1	Door Contact Switch	BY SECURITY - PREP DOOR/FRAME		OT		
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: Presenting authorized credential to integral card reader will unlock trim allowing access. Free egress by lever. Emergency access by key.

Set: 5.0

Doors: V02B, V03B, V04B, V05B, V06B

2	Continuous Hinge	CFM__SLI-HD1 - DOOR HEIGHT		PE	087100	
2	Push Bar & Pull	BF15847 (mounting as required)	US32D	RO	087100	
2	Conc Overhead Stop	6-X36	630	RF	087100	
1	Automatic Opener (pair)	D6021-36 D	689	NO	087100	⚡
2	Door Switch	501		NO	087100	⚡

Notes: Perimeter/meeting stile seals by frame/door supplier.
Pushing either wall switch will activate operators allowing access or egress.

Set: 6.0

Doors: V03A, V04A, VO1A, VO2A, VO6A

2	Continuous Hinge	CFM__SLI-HD1 SER12 - DOOR HT		PE	087100	⚡
1	Concealed Vert Rod Exit	64 56-SN200-ADPE8610 P106x862	US32D	SA	281500	⚡
1	Concealed Vert Rod Exit, Exit Only	55 56 ADPE8610 EO	US32D	SA	087100	⚡
1	Core	6300	US15	SA	087100	
2	Conc Overhead Stop	6-X36	630	RF	087100	
1	Automatic Opener (pair)	D6021-36 D	689	NO	087100	⚡
1	Astragal	297AS		PE	087100	
1	Rain Guard	346C		PE	087100	
1	Gasketing	5110BL		PE	087100	
2	Sweep	3452CNB		PE	087100	
1	Threshold	272A MSES25SS		PE	087100	
2	Door Harness	QC-C___ - LENGTH TO SUIT		MK	087100	⚡
2	Frame Harness	QC-C1500P		MK	087100	⚡
1	Door Switch	501		NO	087100	⚡
2	Door Contact Switch	BY SECURITY - PREP DOOR/FRAME		OT		
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: Presenting authorized credential to integral card reader will retract latches and activate operator allowing access. Free egress by exit device. Pushing inside wall switch will retract latches and activate operator allowing egress. Emergency access by key.

Set: 7.0

Doors: 127.1

1	Continuous Hinge	CFM__SLI-HD1 SER12 - DOOR HT		PE	087100	⚡
1	Rim Exit Device	64 56-SN200-PE8804 862	US32D	SA	281500	⚡
1	Core	6300	US15	SA	087100	
1	Surface Closer	CPS7500 DA (brackets and drop plate as req'd)	689	NO	087100	
1	Rain Guard	346C		PE	087100	
1	Sweep	3452CNB		PE	087100	
1	Threshold	272A MSES25SS		PE	087100	
1	Door Harness	QC-C___ - LENGTH TO SUIT		MK	087100	⚡
1	Frame Harness	QC-C1500P		MK	087100	⚡
1	Door Contact Switch	BY SECURITY - PREP DOOR/FRAME		OT		
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: Perimeter seals by frame supplier.
Electronic Operation: Valid card or key retracts latchbolt. Free egress at all times. In case of power loss, door remains locked and latched.

Set: 8.0

Doors: GH01, GH02

1	Mortise Cylinder	60 42	US32D	SA	087100
3	Core	6300	US15	SA	087100

Notes: Remainder door, frame and hardware by greenhouse manufacturer.

Set: 9.0

Doors: 128.1, 152.1, 153.1

1	Continuous Hinge	CFM__SLI-HD1 SER12 - DOOR HT		PE	087100
1	Continuous Hinge	CFM__SLI-HD1 - DOOR HT		PE	087100
1	Card Reader Lock	64 SN200-82271-24V LNL	US26D	SA	281500
2	Flush Bolt	555 (Metal)/ 557 (Wood)	US26D	RO	087100
1	Dust Proof Strike	570	US26D	RO	087100
1	Core	6300	US15	SA	087100
2	Surface Closer	CPS7500T (brackets and drop plate as req'd)	689	NO	087100
2	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Astragal	305SSE		PE	087100
1	Gasketing	S88BL (Head & Jambs)		PE	087100
2	Sweep	307APK		PE	087100
1	Threshold	272A MSES25SS		PE	087100
1	Door Harness	QC-C___ - LENGTH TO SUIT		MK	087100
1	Frame Harness	QC-C1500P		MK	087100
2	Door Contact Switch	BY SECURITY - PREP DOOR/FRAME		OT	
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100

Notes: Operation: Card reader retracts latchbolt at active leaf allowing access. Key outside retracts latchbolt allowing access. Lever inside retracts latchbolt allowing egress at all times.

Set: 10.0

Doors: 127

4	Electric Hinge, Hvy Wt	T4A3786-QC12	US26D	MK	087100	⚡
2	Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK	087100	
1	Surface Vert Rod Exit, Exit Only	55 PE8710 EO NB	US32D	SA	087100	
1	Surface Vertical Rod Exit Device	NB 64 56-SN200-PE8706 WEL	US32D	SA	281500	⚡
1	Core	6300	US15	SA	087100	
2	Surface Closer	CPS7500T (brackets/drop plate as req'd)	689	NO	087100	
2	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1	Wiring Diagram	WD-SYSPK (Elevations and Point to Point)		SA	087100	
1	Astragal	S771BL LAR		PE	087100	
1	Gasketing	S88BL (Head & Jambs)		PE	087100	
2	ElectroLynx Harness (frame)	QC-C1500P		MK	087100	⚡
2	ElectroLynx Harness (door)	QC-C*** (Length / Type as Req'd)		MK	087100	⚡
2	Door Contact Switch	BY SECURITY - PREP DOOR/FRAME		OT		
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: Operation: Card reader unlocks active leaf exit device allowing access. Exit device at active leaf and inactive leaf retracts latch bolt allowing free egress at all times. Key outside unlocks trim.

Set: 11.1

Doors: 157, 174

2	Electric Hinge, Hvy Wt	T4A3786-QC12	US26D	MK	087100	⚡
4	Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK	087100	
1	Surface Vert Rod Exit, Dummy	55 56 PE8710 WEL NB	US32D	SA	087100	⚡
1	Surface Vertical Rod Exit Device	NB 64 56-SN200-PE8706 WEL	US32D	SA	281500	⚡
1	Core	6300	US15	SA	087100	
2	Surface Closer	J7500 (brackets and drop plate as req'd)	689	NO	087100	
2	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
2	Electromagnetic Holder	980M	689	RF	087100	⚡
1	Astragal	S771BL LAR		PE	087100	
1	Gasketing	S88BL (Head & Jambs)		PE	087100	
2	ElectroLynx Harness (frame)	QC-C1500P		MK	087100	⚡
2	ElectroLynx Harness (door)	QC-C*** (Length / Type as Req'd)		MK	087100	⚡
2	Door Contact Switch	BY SECURITY - PREP DOOR/FRAME		OT		
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: Presenting authorized credential to integrated card reader unlocks exit device allowing access. exit device allows egress at all times. Pushing rail activates rex switch.
Security system unlocks exit devices during school hours and relocks exit devices after hours.
Lockdown by security system would lock exit devices and lockout card reader.
Fire alarm activation closes doors.

Set: 11.2

Doors: 155

2	Electric Hinge, Hvy Wt	T4A3786-QC12	US26D	MK	087100	⚡
4	Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK	087100	
1	Concealed Vert Rod Exit, Exit Only	NB 55 56 64 (AD/MD)PE8610 EO	US32D	SA	087100	⚡
1	Concealed Vert Rod Exit	NB 64 56-SN200-(AD/MD)PE8606 WEL	US32D	SA	281500	⚡
1	Core	6300	US15	SA	087100	
2	Surface Closer	J7500 (brackets and drop plate as req'd)	689	NO	087100	
2	Electromagnetic Holder	980M	689	RF	087100	⚡
1	Weatherstrip	BY DOOR SUPPLIER		OT		
2	ElectroLynx Harness (frame)	QC-C1500P		MK	087100	⚡
2	ElectroLynx Harness (door)	QC-C*** (Length / Type as Req'd)		MK	087100	⚡
2	Door Contact Switch	BY SECURITY - PREP DOOR/FRAME		OT		
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: Presenting authorized credential to integrated card reader unlocks exit device allowing access. exit device allows egress at all times. Pushing rail activates rex switch.
Security system unlocks exit devices during school hours and relocks exit devices after hours.
Lockdown by security system would lock exit devices and lockout card reader.
Fire alarm activation closes doors.

Set: 12.0

Doors: K01, P01

2	Electric Hinge, Hvy Wt	T4A3786-QC12	US26D	MK	087100	⚡
4	Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK	087100	
1	Concealed Vert Rod Exit, Exit Only	NB 55 56 64 (AD/MD)PE8610 EO	US32D	SA	087100	⚡
1	Concealed Vert Rod Exit	NB 64 56-SN200-(AD/MD)PE8606 WEL	US32D	SA	281500	⚡
1	Core	6300	US15	SA	087100	
2	Surface Closer	(PR) 7500 (Reg or PA) (brackets and drop plate as req'd)	689	NO	087100	
2	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
2	Electromagnetic Holder	980M	689	RF	087100	⚡
1	Astragal	S771BL LAR		PE	087100	
1	Gasketing	S88BL (Head & Jambs)		PE	087100	
2	ElectroLynx Harness (frame)	QC-C1500P		MK	087100	⚡
2	ElectroLynx Harness (door)	QC-C*** (Length / Type as Req'd)		MK	087100	⚡
2	Door Contact Switch	BY SECURITY - PREP DOOR/FRAME		OT		
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: Operation: Door normal held open by electromagnetic holder. Upon remote release and upon fire alarm, electromagnetic disengages and door closes and latches. Exit devices at each leaf retract latchbolt allowing egress. Card reader retracts latchbolt allowing entry. Key unlocks leaver allowing entry.

Set: 13.0

Doors: 152

1	Electric Hinge, Hvy Wt	T4A3786-QC12	US26D	MK	087100
5	Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK	087100
1	Access Control Mort Lock	63 SN200-82271-24V LNL	US26D	SA	281500
2	Flush Bolt	555 (Metal)/ 557 (Wood)	US26D	RO	087100
1	Dust Proof Strike	570	US26D	RO	087100
1	Core	6300	US15	SA	087100
2	Surface Closer	7500 (brackets and drop plate as req'd)	689	NO	087100
2	Kick Plate	K1050 10" BEV CSK	US32D	RO	087100
1	Astragal	S771BL LAR		PE	087100
1	Gasketing	S88BL (Head & Jambs)		PE	087100
1	ElectroLynx Harness (frame)	QC-C1500P		MK	087100
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Req'd)		MK	087100
2	Door Contact Switch	BY SECURITY - PREP DOOR/FRAME		OT	
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100

Notes: Operation: Card reader retracts latchbolt allowing access. Key outside retracts latchbolt allowing access. Lever inside at active leaf allows egress at all times.

Set: 14.0

Doors: 106, 108, 117, 118, 120, 135, 137, 138, 140, 144, 146, 159, 160, 170, 171

1	Electric Hinge	TA2714-QC12	US26D	MK	087100
2	Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100
1	Access Control Mort Lock	64 PHR SN200-82281-24V LNL	US26D	SA	281500
1	Core	6300	US15	SA	087100
1	Kick Plate	K1050 10" BEV CSK	US32D	RO	087100
1	Wall Stop	409	US32D	RO	087100
3	Silencer	608 (or) 609		RO	087100
1	ElectroLynx Harness (frame)	QC-C1500P		MK	087100
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Req'd)		MK	087100
1	Door Contact Switch	BY SECURITY - PREP DOOR/FRAME		OT	
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100

Notes: Operation: Door locked at all times. Lever inside retracts latch bolt and dead bolt allowing free egress at all times. Thumb-turn inside projects and retracts dead bolt. Key outside retracts latch bolt and dead bolt allowing access. Card reader unlocks latch bolt only. Card reader allows access only when dead bolt is retracted.

Set: 15.0

Doors: 103H, 103J, 177

1	Electric Hinge	TA2714-QC12	US26D	MK	087100
2	Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100
1	Access Control Mort Lock	63 SN200-82271-24V LNL	US26D	SA	281500
1	Core	6300	US15	SA	087100
1	Surface Closer	CPS7500 (brackets and drop plate as req'd)	689	NO	087100
1	Kick Plate	K1050 10" BEV CSK	US32D	RO	087100
1	Gasketing	S88BL (Head & Jambs)		PE	087100
1	ElectroLynx Harness (frame)	QC-C1500P		MK	087100
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Required)		MK	087100
1	Door Contact Switch	BY SECURITY - PREP DOOR/FRAME		OT	
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100

Notes: Operation: Lever inside retracts latchbolt allowing egress at all times. Card reader unlocks electric trim allowing access. Key outside retracts latch bolt.

Set: 16.1

Doors: 101, 111, 115, 121, 122, 123, 123B, 124, 129, 141, 143, 161, 165, 166, 168, 169

1	Electric Hinge	TA2714-QC12	US26D	MK	087100
2	Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100
1	Access Control Mort Lock	63 SN200-82271-24V LNL	US26D	SA	281500
1	Core	6300	US15	SA	087100
1	Surface Closer	R7500 (or) PR7500 (brackets and drop plate as req'd)	689	NO	087100
1	Kick Plate	K1050 10" BEV CSK	US32D	RO	087100
1	Wall Stop	409	US32D	RO	087100
1	Gasketing	S88BL (Head & Jambs)		PE	087100
1	ElectroLynx Harness (frame)	QC-C1500P		MK	087100
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Req'd)		MK	087100
1	Door Contact Switch	BY SECURITY - PREP DOOR/FRAME		OT	
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100

Notes: Operation: Lever inside retracts latchbolt allowing egress at all times. Card reader unlocks electric trim allowing access. Key outside retracts latch bolt.

Set: 16.2

Doors: 101B, 102B, 158A, 158B

3	Electric Hinge	TA2714-QC12	US26D	MK	087100
3	Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100
1	Access Control Mort Lock	63 SN200-82271-24V LNL	US26D	SA	281500
1	Core	6300	US15	SA	087100
1	Surface Closer	R7500 (or) PR7500 (brackets and drop plate as req,d)	689	NO	087100
1	Kick Plate	K1050 10" BEV CSK	US32D	RO	087100
1	Wall Stop	409	US32D	RO	087100
3	Silencer	608 (or) 609		RO	087100
1	ElectroLynx Harness (frame)	QC-C1500P		MK	087100
1	ElectroLynx Harness (door)	QC-C*** (Length / Type as Req,d)		MK	087100
1	Door Contact Switch	BY SECURITY - PREP DOOR/FRAME		OT	
1	Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100

Notes: Operation: Lever inside retracts latchbolt allowing egress at all times. Card reader unlocks electric trim allowing access. Key outside retracts latch bolt.

Set: 17.0

Doors: 129B, 155B

3	Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100
1	Storeroom/Closet Lock	63 8204 LNL	US26D	SA	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
3	Silencer	608		RO	087100

Set: 18.0

Doors: 110, 112, 116, 126, 131, 133, 142, 149, 151, 156, 164, 175

3	Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100
1	Storeroom/Closet Lock	63 8204 LNL	US26D	SA	087100
1	Surface Closer	7500 (brackets and drop plate as req'd)	689	NO	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall Stop	409	US32D	RO	087100
3	Silencer	608		RO	087100

Set: 19.0

Doors: 113, 132, 150, 163

3 Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100
1 Timeout Lock	47PL33 3 point		SR	
1 Surface Closer	7500 (brackets and drop plate as req'd)	689	NO	087100
1 Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1 Wall Stop	409	US32D	RO	087100
1 Gasketing	S88BL (Head & Jambs)		PE	087100

Notes: Time out lock requires supervision to maintain locking of latches.

Set: 19.1

Doors: 165B

3 Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100
1 Storeroom/Closet Lock	63 8204 LNL	US26D	SA	087100
1 Surface Closer	CPS7500 (brackets and drop plate as required)	689	NO	087100
1 Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
3 Silencer	608		RO	087100

Set: 20.0

Doors: 101E, 101F, 101G, 102A, 103A, 103B, 103C, 103D, 103E, 103F, 125, 128A, 153, 177A

3 Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100
1 Office/Entry Lock	WBS 63 8205 LNL	US26D	SA	087100
1 Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
1 Gasketing	S88BL (Head & Jambs)		PE	087100

Set: 21.0

Doors: 100A, 153B

3 Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100
1 Passage Latch	8215 LNL	US26D	SA	087100
1 Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
1 Gasketing	S88BL (Head & Jambs)		PE	087100

Set: 22.0

Doors: 103G, 157B

6 Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100
1 Classroom Lock	63 8237 LNL	US26D	SA	087100
2 Flush Bolt	555 (Metal)/ 557 (Wood)	US26D	RO	087100
1 Dust Proof Strike	570	US26D	RO	087100
1 Surf Overhead Stop	10-X36 5258	689	RF	087100
1 Surface Closer	7500 (brackets and drop plate as req'd)	689	NO	087100
2 Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
2 Silencer	608		RO	087100

Set: 23.0

Doors: 127A, 155E, 157A

6 Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100
1 Classroom Lock	63 8237 LNL	US26D	SA	087100
2 Flush Bolt	555 (Metal)/ 557 (Wood)	US26D	RO	087100
1 Dust Proof Strike	570	US26D	RO	087100
2 Surf Overhead Stop	10-X36 5258	689	RF	087100
2 Surface Closer	CPS7500 (brackets and drop plate as req'd)	689	NO	087100
2 Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
2 Silencer	608		RO	087100

Set: 24.0

Doors: 121B, 123A, 128B, 155A

3 Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100
1 Classroom Lock	63 8237 LNL	US26D	SA	087100
1 Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1 Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
3 Silencer	608		RO	087100

Set: 25.0

Doors: 127B, 127C

3	Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK	087100
1	Classroom Lock	63 8237 LNL	US26D	SA	087100
1	Surface Closer	(PR) 7500 (Reg or PA) (brackets and drop plate as req'd)	689	NO	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall Stop	409	US32D	RO	087100
3	Silencer	608		RO	087100

Set: 26.0

Doors: 100C

3	Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100
1	Dormitory/Exit Lock (Deadbolt & Indicator)	V01 WBS 64 8225 LNL	US26D	SA	087100
1	Surface Closer	7500 (brackets and drop plate as req'd)	689	NO	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
3	Silencer	608		RO	087100

Notes: Operation: Lever inside retracts latch bolt and dead bolt allowing free egress at all times. Thumb-turn inside locks and unlocks outside trim and projects and retracts dead bolt. Key outside unlocks trim and retracts and projects deadbolt allowing access. Indicator inside shows position of dead bolt; "LOCKED" or "UNLOCKED." Outside does not include indicator.

Set: 27.0

Doors: 153C

3	Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK	087100
1	Classroom Security Intruder Lock	63 8238 LNL	US26D	SA	087100
1	Surface Closer	7500 (brackets and drop plate as req'd)	689	NO	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
1	Gasketing	S88BL (Head & Jambs)		PE	087100

Set: 28.0

Doors: 114, 162, 176

3	Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100
1	Dormitory/Exit Lock (Deadbolt & double Indicator)	V21 WBS 64 8225 LNL	US26D	SA	087100
1	Core	6300	US15	SA	087100
1	Surface Closer	R7500 (or) PR7500 (brackets and drop plate as req'd)	689	NO	087100
2	Kick Plate	K1050 10" BEV CSK	US32D	RO	087100
1	Kick Plate	K1050 6" CSK BEV	US32D	RO	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
1	Gasketing	S88BL (Head & Jambs)		PE	087100

Set: 29.0

Doors: 102C, 121A, 128C, 129A, 153A

3	Hinge, Full Mortise	TA2714 (NRP)	US26D	MK	087100
1	Privacy Lock	V21 8265 LNL	US26D	SA	087100
1	Kick Plate	K1050 10" BEV CSK	US32D	RO	087100
1	Kick Plate	K1050 6" CSK BEV	US32D	RO	087100
1	Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100
3	Silencer	608 (or) 609		RO	087100

Set: 30.0

Doors: 104, 105, 147, 148, 172, 173

3	Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK	087100
1	Classroom Lock	63 8237 LNL	US26D	SA	087100
1	Surface Closer	R7500 (or) PR7500 (brackets and drop plate as req'd)	689	NO	087100
1	Kick Plate	K1050 10" BEV CSK	US32D	RO	087100
1	Wall Stop	409	US32D	RO	087100
1	Gasketing	S88BL (Head & Jambs)		PE	087100

Set: 31.0

Doors: 100

1 Electric Hinge, Hvy Wt	T4A3786-QC12	US26D	MK	087100	⚡
2 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK	087100	
1 Card Reader Lock	64 SN200-82271-24V LNL	US26D	SA	281500	⚡
1 Core	6300	US15	SA	087100	
1 Surface Closer	7500 (brackets and drop plate as req'd)	689	NO	087100	
1 Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100	
1 Gasketing	S88BL (Head & Jambs)		PE	087100	
1 Sweep	307APK		PE	087100	
1 ElectroLynx Harness (frame)	QC-C1500P		MK	087100	⚡
1 ElectroLynx Harness (door)	QC-C*** (Length / Type as Req'd)		MK	087100	⚡
1 Pushbutton	PB		SU	087100	⚡
1 Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: Operation: Lever inside retracts latchbolt allowing egress at all times. Card reader or push button at desk unlocks electric trim allowing access. Key outside retracts latch bolt.

Set: 32.0

Doors: 100B

1 Electric Hinge, Hvy Wt	T4A3786-QC12	US26D	MK	087100	⚡
2 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK	087100	
1 Fail Secure Electric Lock	63 8271-24V LNL (modified inside trim rigid, outside trim electric fail secure)	US26D	SA	087100	⚡
1 Electric Strike	1600-CS-LM 2004M 2005M	630	HS	087100	⚡
1 Surface Closer	7500 (brackets and drop plate as req'd)	689	NO	087100	
1 Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1 Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100	
3 Silencer	608		RO	087100	
2 ElectroLynx Harness (frame)	QC-C1500P		MK	087100	⚡
1 ElectroLynx Harness (door)	QC-C*** (Length / Type as Req'd)		MK	087100	⚡
1 Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: Card reader by others. During normal school hours corridor trim is unlocked electrically. Reception trim is always locked. Electric strike is operated by card reader or push button at reception desk. After school hours the corridor trim is locked electrically and access or egress is by card reader which unlocks electric strike. Emergency access or egress is by key.

Set: 33.0

Doors: 101A, 130, 167

1 Electric Hinge, Hvy Wt	T4A3786-QC12	US26D	MK	087100	⚡
2 Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK	087100	
1 Access Control Mort Lock	63 SN200-82271-24V LNL	US26D	SA	281500	⚡
1 Surface Closer	7500 (brackets and drop plate as req'd)	689	NO	087100	
1 Wall/ Floor Stop	RM861 / RM850	US32D	RO	087100	
1 Gasketing	S88BL (Head & Jambs)		PE	087100	
1 ElectroLynx Harness (frame)	QC-C1500P		MK	087100	⚡
1 ElectroLynx Harness (door)	QC-C*** (Length / Type as Req'd)		MK	087100	⚡
1 Power Supply w/ Distribution Board	AQL4-R8E1		SU	087100	⚡

Notes: Operation: Lever inside retracts latchbolt allowing egress at all times. Card reader unlocks electric trim allowing access. Key outside retracts latch bolt.

Set: 34.0

Doors: 107A, 107B, 117B, 119A, 119B, 136, 136A, 139, 139A, 145, 145A

1 Mortise Cylinder	60 42	US32D	SA	087100
1 Core	6300	US15	SA	087100
1 Classroom Lock	S9670 202	630	RS	083473

Notes: Remainder of hardware supplied by Rite Slide door manufacturer.
Surface sliding system to be determined.

Set: 35.0

Doors: 106A, 108A, 117A, 118A, 120A, 135A, 137A, 138A, 140A, 144A, 146A, 159A, 159B, 170A, 170B

1 Mortise Cylinder	60 42	US32D	SA	087100
1 Core	6300	US15	SA	087100
1 Privacy Lock	S5340 S460PI	630	RS	083473

Notes: Remainder of hardware supplied by Rite Slide door manufacturer.

Set: 36.0

Doors: 001A, 001B

3 Hinge, Wide Throw	TA2798 4-1/2" (width to be determined based on panel thickness)	US26D	MK	087100
1 Deadlock	63 8220	US26D	SA	087100
1 Gasketing	S88BL (Head & Jambs)		PE	087100

Set: 37.0

Doors: 127D, CY2I

1	Hardware	BY DOOR SUPPLIER	OT	

Set: 38.0

Doors: ZMISC

1	Wiring Diagram	WD-SYSPK (Elevations and Point to Point)	SA	087100
1	Test Unit	WT1	SA	281500
1	Repair Kit	QC-R001	MK	087100
1	Crimp Tool	QC-R003	MK	087100
1	Key Management	T21-EA-100117	MC	087100

END OF SECTION

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SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Thermally insulated hollow metal doors with frames.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

H. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.

I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

J. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

K. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

L. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2007.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than twenty years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

C. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   3. Mesker, dormakaba Group: www.meskeropeningsgroup.com/#sle.
   4. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
   5. Steelcraft, an Allegion brand: www.allegion.com/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
   4. Door Edge Profile: Manufacturers standard for application indicated.
   5. Typical Door Face Sheets: Flush.
   6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
   7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
   8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
      a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Interior and Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 3 - Extra Heavy-duty.
      b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 16 gauge, 0.053 inch, minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Core Material: Polyurethane, 1.8 lbs/cu ft minimum density.

3. Door Thermal Resistance: R-Value of 8.7, minimum, for installed thickness of polyurethane, test method ASTM C518.
4. Door Thickness: 1-3/4 inches, nominal.
5. Weatherstripping: Refer to Section 08 71 00.
6. Door Finish: Factory primed and field finished.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Exterior Door Frames: Full profile/continuously welded type.
1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
2. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
3. Frame Finish: Factory primed and field finished.
4. Weatherstripping: Separate, see Section 08 71 00.

C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
1. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
2. Frame Finish: Factory primed and field finished.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

A. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

B. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Install door hardware as specified in Section 08 71 00.

D. Touch up damaged factory finishes.

3.03 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

END OF SECTION

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SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush configuration; fire rated, non-rated, and acoustical.

1.02 RELATED REQUIREMENTS

A. Section 08 11 13 - Hollow Metal Doors and Frames.

B. Section 08 71 00 - Door Hardware.

C. Section 09 93 00 - Staining and Transparent Finishing: Field finishing of doors.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.

C. ICC (IBC) - International Building Code; 2003.

D. UBC Std 7-2, Part II - Test Standard for Smoke- and Draft-control Assemblies; International Conference of Building Officials; 1997.

E. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

F. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Qualifications: Submit manufacturer's qualifications.

C. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

D. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

E. Samples: Submit two samples of door veneer, 6 by 8 inches in size illustrating wood grain, stain color, and sheen.

F. Test Reports: Show compliance with specified requirements for the following:
   1. Sound-retardant doors and frames; sealed panel tests are not acceptable.

G. Manufacturer's Installation Instructions: Indicate special installation instructions.

H. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum twenty years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 PROJECT CONDITIONS

A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.
   1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.
   2. Provide for replacing, including cost of rehanging and refinishing, at no cost to Owner, wood doors exhibiting defects in materials or workmanship including warp and delaminating for the life of installation.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
   1. Graham Wood Doors: www.grahamdoors.com.
   2. Eggers Industries: www.eggersindustries.com/#sle.
   3. Marshfield DoorSystems, Inc: www.marshfielddoors.com/#sle.
   4. Oshkosh Door Company: www.oshkoshdoor.com/#sle.
   5. VT Industries, Inc: www.vtindustries.com/#sle.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOORS

A. All Doors: See drawings for locations and additional requirements.
   1. Quality Level: Custom Grade, Extra Heavy Duty performance, in accordance with WDMA I.S.1-A.
   2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches; thick unless otherwise indicated; flush construction.
   1. Smoke and Draft Control Doors: In addition to required fire rating, provide door assemblies tested in accordance with UL 1784 with maximum air leakage of 3.0 cfm per sq ft of door opening at 0.10 inch wg pressure at both ambient and elevated temperatures for "S" label; if necessary, provide additional gasketing or edge sealing.
   2. Sound Retardant Doors: Minimum STC of 45, calculated in accordance with ASTM E413, tested in accordance with ASTM E1408.
   3. Wood veneer facing for field transparent finish.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type structural composite lumber core (SCLC), plies and faces as indicated above.

2.04 DOOR FACINGS

A. Wood Veneer Facing for Transparent Finish: White birch "A", veneer grade as specified by quality standard.
   1. Cut: Rotary cut.
   2. Veneer match: Book match and balanced.
   3. Vertical Edges: Same species as face veneer.

B. Facing Adhesive: Type II - water resistant.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge for hardware reinforcement.
   2. Provide solid blocking for other through bolted hardware.

C. Fit door edge trim to edge of stiles after applying veneer facing.

D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

F. Provide edge clearances in accordance with the quality standard specified.

G. Miter edge of corner-set pocket doors which meet at 90 degrees.

2.06 FACTORY FINISHING - WOOD VENEER DOORS

A. Factory finish doors in accordance with specified quality standard:
   1. Transparent Finish: Transparent catalyzed polyurethane, Custom quality, semi-gloss sheen.

B. Factory finish doors in accordance with approved sample.

C. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

A. Hollow Metal Door Frames: As specified in Section 08 12 13.

B. Glazed Openings:
   1. Laminated Safety Glass: Comply with 16 CFR 1201 test requirements for Category II.
   2. Tint: Clear.

C. Glazing Stops: Wood, of same species as door facing, mitered corners; prepared for countersink style screws. Install wood plug at screw holes.

D. Door Hardware: As specified in Section 08 71 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Factory prep for hardware. If required, use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

3.03 TOLERANCES

A. Conform to specified quality standard for fit and clearance tolerances.

B. Conform to specified quality standard for telegraphing, warp, and squareness.

C. Maximum Diagonal Distortion (Warp): 1/8 inch measured with straight edge or taut string, corner to corner, over an imaginary 36 by 84 inches surface area.

D. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taut string, top to bottom, over an imaginary 36 by 84 inches surface area.

E. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 by 84 inches surface area.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.05 SCHEDULE - SEE DRAWINGS

END OF SECTION

SECTION 08 16 13
FIBERGLASS DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass doors.

B. Fiberglass door frames.

C. Fiberglass borrowed lite frames.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

B. Section 08 80 00 - Glazing.

1.03 REFERENCE STANDARDS

A. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2014.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

C. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2019c.

D. ICC (IBC) - International Building Code; 2015.

E. ITS (DIR) - Directory of Listed Products; current edition.

F. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

G. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

H. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Obtain hardware templates from hardware manufacturer prior to starting fabrication.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements.

B. Product Data: Provide manufacturer's standard details, installation instructions, hardware and anchor recommendations.

C. Shop Drawings: Indicate layout and profiles; include assembly methods.
   1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns, and textures.
   2. Indicate wall conditions, door and frame elevations, sections, materials, gauges, finishes, location of door hardware by dimension, and details of openings; use same reference numbers indicated on drawings to identify details and openings.

D. Selection Samples: Submit two complete sets of full line color chips, illustrating manufacturer's available finishes, colors, and textures.

E. Verification Samples: Submit door surface samples for each finish specified, 10 inches by 10 inches in size, illustrating finishes, colors, and textures.

F. Test Reports: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. Maintenance Data: Include instructions for repair of minor scratches and damage.

J. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer; include detailed terms of warranty.

K. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

C. **Source limitations: Hardware and accessories for all FRP doors as specified in Section 08710 shall be provided and installed by the fiberglass door and frame manufacturer.**

D. **Source Limitations: Glass for windows in doors shall be furnished and installed by door and frame manufacturer in accordance with related section, Division 8, Glazing.**

1.07 DELIVERY, STORAGE, AND HANDLING

A. Mark doors with location of installation, door type, color, and weight.

B. Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

C. Deliver pre-assembled doors and frames with braces, spreaders, and packaging as required to prevent damage.

D. Store materials in original packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.
   1. Store at temperature and humidity conditions recommended by manufacturer.
   2. Do not use non-vented plastic or canvas shelters.
   3. Immediately remove wet wrappers.

E. Store in position recommended by manufacturer, elevated minimum 4 inches above grade, with minimum 1/4 inch space between doors.

1.08 FIELD CONDITIONS

A. Do not install doors until structure is enclosed.

B. Maintain temperature and humidity at manufacturer's recommended levels during and after installation of doors.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide lifetime year manufacturer warranty covering materials and workmanship, including degradation or failure due to chemical contact.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Molded Fiberglass Doors:
   1. Basis-of-Design: Chem-Pruf Door Co., Ltd., Model CP1.
   2. Available Manufacturers: Subject to compliance with drawings and specifications, products from the following manufacturers may be provided.
      a. ChemPruf Door Company, Ltd: www.chem-pruf.com/#sle.
      b. Tiger Door, LLC: www.tigerdoor.com/#sle.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOOR AND FRAME ASSEMBLIES

A. Door and Frame Assemblies: Factory-fabricated, prepared and machined for hardware.
   1. Operation: Manual.
   2. Physical Endurance: Extra Heavy-Duty.

3. Surface Burning Characteristics: Flame spread index (FSI) of 0 to 25, Class A, and smoke developed index (SDI) of 450 or less, when tested in accordance with ASTM E84.
4. Flammability: Self-extinguishing when tested in accordance with ASTM D635.
5. Chemical Resistance: Resist degradation due to exposure to tap water and distilled water.
   a. Chlorine-treated moisture in air.
6. Sizes: As indicated on drawings.
7. Clearance Between Door and Frame: 1/8 inch, maximum.
8. Clearance Between Meeting Stiles of Pairs of Doors: 1/8 inch, maximum.
9. Clearance Between Bottom of Door and Finished Floor: 3/4 inch, maximum; not less than 1/4 inch clearance to threshold.
10. Provide frame anchors that allow for variation in rough opening size; field cutting of doors or frames to fit is not permitted.

B. Fire-Rated Doors and Frames: Comply with fire-ratings as indicated on drawings.
   1. Tested in accordance with ICC (IBC) for positive pressure or UL 10C.
   2. ITS (DIR) or UL (DIR) listed and labeled.
   3. Visible seals when doors are closed is not permitted.

2.03 COMPONENTS

A. Doors:
   1. Doors shall be made of fiberglass reinforced plastic (FRP) using Class 1 premium resin with no fillers that is specifically tailored to resist chemicals and contaminants typically found in environment for which these specifications are written. Doors shall be 1 ¾ inch thick and of flush construction, having no seams or cracks. For consistency in the resin chemistry tailored for this application and to maintain the same physical properties throughout the structure, all fiberglass components including face plates, stiles and rails and frames must be fabricated by the same manufacturer. Components obtained through various outside sources for plant assembly will not be accepted.
   2. Door Plates shall be 0.125 inch thick minimum, molded in one continuous piece, starting with 25 mil gelcoat of the color specified, integrally molded with multiple layers of 1.5 ounces per square foot fiberglass mat and one layer of 18 ounce per square yard fiberglass woven roving. Each layer shall be individually laminated with resin as mentioned above. Door plate weight shall not be less than 0.97 lbs per square foot at a ratio of 30/70 glass to resin. Plate alone to withstand Large Missile Impact per FBC TAS 201. Face plates manufactured using the pultrusion process does not allow for a smooth molded gelcoat finish, the use of woven roving for adequate plate thickness, strength and weight, or the appropriate glass to resin ratio and will not meet the quality standards of this project.
   3. Stiles and Rails shall be constructed starting from the outside toward the inside, with a matrix of at least three layers of 1.5 ounce per square foot of fiberglass mat. The stile and rail shall be molded in one continuous piece to a U-shaped configuration and to the exact dimensions of the door. In this manner there will be no miter joints and disparate materials used to form the one-piece stile and rail.
   4. Core material shall be Polypropylene plastic honeycomb core with a non woven polyester veil for unparalleled plate bonding, 180 PSI typical compression range unless otherwise requested.
   5. Internal Reinforcement shall be #2 SPF of sufficient amount to adequately support required hardware and function of same.
   6. Finish of door frame shall be identical with 25 mil resin-rich gelcoat of the specified color integrally molded in at time of manufacture resulting in a smooth gloss surface that is dense and non-porous. To achieve optimum surface characteristics, the gelcoat shall be cured within a temperature range of 120F to 170F creating an impermeable outer surface, uniform color throughout, and a permanent homogeneous bond with the resin/fiberglass substrate beneath. Only the highest quality gelcoat will be used to ensure enduring color and physical properties. Paint and/or post application of gelcoat results in poor mechanical fusion and will be deemed unacceptable for this application. The finish of the

door and frame must be field repairable without compromising the integrity of the original uniform composite structure, function or physical strength.

7. Window openings shall be provided for at time of manufacture and shall be completely sealed so that the interior of the door is not exposed to the environment. Fiberglass retainers, which hold the glazing in place, shall be resin transfer molded with a profile that drains away from glazing. The window retainer must match the color and finish of the door plates with 25 mil of resin-rich gelcoat integrally molded in at time of manufacture. Mechanical fasteners shall not be used to attach retainers. Glass, as specified herein, shall be furnished and installed by door and frame manufacturer. In order to maintain uniform appearance, product longevity and the corrosion resistance this application requires, window retainers fabricated from Metal, PVC or Vinyl will not be accepted.

B. Frames:
1. Frames (rated and non-rated) shall be fiberglass and manufactured using the resin transfer method creating one solid piece (no voids) with complete uniformity in color and size. Beginning with a minimum 25 mil gelcoat layer molded in and a minimum of two layers of continuous strand fiberglass mat saturated with resin, the frame will be of one-piece construction with molded stop. All frame profiles shall have a core material of 2 psf polyurethane foam. Metal frames or pultruded fiberglass frames will not be accepted.
2. Finish of frame shall be identical to the door with 25 mil resin-rich gelcoat of the specified color integrally molded in at time of manufacture. To achieve optimum surface characteristics, the gelcoat shall be cured within a temperature range of 120F to 170F creating an impermeable outer surface, uniform color throughout, and a permanent homogeneous bond with the resin/fiberglass substrate beneath. Only the highest quality gelcoat will be used to ensure enduring color and physical properties. Paint and/or post application of gelcoat result in poor mechanical fusion and will be deemed unacceptable for this application. The finish of the door and frame must be field repairable without compromising the integrity of the original uniform composite structure, function or physical strength.
3. Jamb/Header connection shall be mitered for tight fit.
4. Internal Reinforcement shall be continuous within the structure to allow for mounting of specified hardware. Reinforcing material shall be a dense matrix of cloth glass fibers and premium resin with a minimum hinge screw holding value of 1000 lbs per screw. All reinforcing materials shall be completely encapsulated. Documented strength of frame screw holding value after third insert must be submitted. Dissimilar materials, such as steel, will be deemed unacceptable as reinforcement for hardware attachment.
5. Mortises for hardware shall be accurately machined by CNC to hold dimensions to +/- 0.010 inch in all three axis.
6. Hinge pockets shall be accurately machined by CNC to facilitate heavy duty hinges at all hinge locations, using shims when standard weight hinges are used.

2.04 FINISHES

A. Gel Coating: Ultraviolet (UV) stabilized polyester finish.
1. Thickness: Minimum 25 mils, 0.025 inch wet thickness, plus/minus 3 mils, 0.003 inch.
2. Color: As selected by Architect from manufacturer's standard line of colors.

2.05 HARDWARE

A. Door Hardware: See Section 08 71 00.

B. The special nature of this material requires that all related hardware as specified must be furnished and installed by the door frame manufacturer to maintain product quality and function as well as to ensure sufficient support/reinforcement, precision tooling and proper sealing methods are provided.

2.06 ACCESSORIES

A. Stops for Glazing: Fiberglass, unless otherwise indicated or required by fire rating; provided by door manufacturer to fit factory made openings, with color and texture to match door; fasteners shall maintain waterproof integrity.

1. Glazed Openings: Provide removable stops on interior side.
2. Opening Sizes and Shapes: As indicated on drawings.

B. Glazing: See Section 08 80 00.

C. Astragals and Edges for Double Doors: Pairs of doors astragals, and door edge sealing and protection devices.
1. UL listed products in compliance with requirements of authorities having jurisdiction.
2. Provide surface mounted astragal to cover or fill space for full door height between pair of doors or door and adjacent jamb.
3. Astragal Type: Split, two parts, and with automatic locking, cutouts for other door hardware, and sealing gasket.
4. Edge Type: Beveled edge
5. Metal Finish: Gray powder coating.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions
1. Verify openings are correctly prepared to receive doors and frames.
2. Verify openings are correct size and depth in accordance with submittal drawings.

B. Installer's Examination
1. Door installer shall examine conditions under which construction activities of this section are to be performed and submit a written report to general contractor if conditions are unacceptable.
2. General Contractor shall submit two copies of the installer's report to the architect within 24 hours of receipt.
3. Installer shall not proceed with installation until all unacceptable conditions have been corrected.

3.02 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

B. Clean and prepare substrate in accordance with manufacturer's directions.

C. Protect adjacent work and finish surfaces from damage during installation.

3.03 INSTALLATION

A. Doors shall be delivered at job site individually crated. Each crate to be clearly marked with the specific opening information for quick and easy identification.

B. All single doors to be shipped completely assembled in the frame with hardware installed. Double doors to be prehung at the factory to ensure a proper fit and that hardware functions properly, then disassembled for shipping purposes.

C. Install door opening assemblies in accordance with shop drawings and manufacturer's printed installation instructions, using installation methods and materials specified in installation instructions.

D. Install fire-rated assemblies in accordance with NFPA 80.

E. Install exterior doors in accordance with ASTM E2112.

F. Set units plumb, level, and true-to-line, without warping or racking doors, and with specified clearances; anchor in place.

G. In masonry walls, install frames prior to laying masonry; anchor frames into masonry mortar joints; fill jambs with grout as walls are laid up.

H. Separate aluminum and other metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.

I. Repair or replace damaged installed products.

3.04 ADJUSTING

A. Lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion, and to fit watertight for entire perimeter.

B. Adjust hardware for smooth and quiet operation.

C. Adjust doors to fit snugly and close without sticking or binding.

3.05 CLEANING

A. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 31 00
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
   1. Location: Where required to service and replace concealed system components.
   2. Panel Material: Steel.
   3. Size: 12 by 12 inches.
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
   6. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

B. Wall-Mounted Units in Wet Areas:
   1. Location: Where required to service and replace concealed system components.
   2. Panel Material: Stainless steel, Type 304.
   3. Size: 12 by 12 inches.
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
   6. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

C. Ceiling-Mounted Units:
   1. Location: Where required to service and replace concealed system components.
   2. Panel Material: Steel, stainless steel, Type 304 in wet areas.
   3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
   4. Size - Other Ceilings: 12 by 12 inches.

2.02 WALL- AND CEILING-MOUNTED ACCESS UNITS

A. Manufacturers:
   1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com/#sle.
   2. ACUDOR Products Inc: www.acudor.com/#sle.
   3. Babcock-Davis: www.babcockdavis.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
   1. Material: Steel, stainless steel Type 304 at wet locations.
   2. Door Style: Single thickness with rolled or turned in edges.
   3. Heavy-Duty Frames: 14-gauge, 0.0747-inch minimum thickness.
   4. Heavy-Duty Single Steel Sheet Door Panels: 14-gauge, 0.0747-inch minimum thickness.

5. Primed and Factory Finish: Polyester powder coat; color to be selected by Architect from Manufacturer's full range..
6. Hardware:
    a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
    b. Latch/Lock: Cylinder lock-operated cam latch, two keys for each unit.
        1) Same key for all units.
    c. Gasketing: Extruded neoprene, around perimeter of door panel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior non-fire-rated coiling doors.

B. Electric operators and control stations.

C. Wiring from electric circuit disconnect to operators and control stations.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 26 05 34 - Conduit: Conduit from electric circuit to operator and from operator to control station.

C. Section 26 27 17 - Equipment Wiring: Power to disconnect.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

D. ITS (DIR) - Directory of Listed Products; current edition.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

F. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).

G. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

H. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide general construction, electrical equipment, and component connections and details.

C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

D. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

E. Specimen warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least five years documented experience.

C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified and indicated.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide lifetime manufacturer warranty for roller shaft counterbalance assembly. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Metal Doors:
1. Cornell Iron Works, Inc: www.cornelliron.com/#sle.
2. Overhead Door Corporation; Model 610 Rolling Service Door: www.overheaddoor.com/#sle.
3. The Cookson Company: www.cooksondoor.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COILING DOORS

A. Interior Non-Fire-Rated Coiling Doors: Steel slat curtain.
1. Single Thickness Slats: Manufacturer's standard.
2. Nominal Slat Size: 2 inches wide by required length.
3. Finish: Factory painted, color as selected.
4. Guides, Angles: Galvanized steel.
5. Hood Enclosure: Manufacturer's standard; primed steel.
6. Electric operation.
7. Mounting: Surface mounted.
8. Locking Devices: Lock and latch handle on outside.

2.03 MATERIALS AND COMPONENTS

A. Metal Curtain Construction: Interlocking slats.
1. Curtain Bottom for Slat Curtains: Fitted with angles to provide reinforcement and positive contact in closed position.
2. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
3. Steel Slats: Minimum thickness, ___ gauge, ___ inch; ASTM A653/A653M galvanized steel sheet.

B. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.

C. Guides - Angle: ASTM A36/A36M metal angles, size as indicated.
1. Hot-dip galvanized in compliance with ASTM A123/A123M.

D. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
1. Prime painted.

E. Lock Hardware:
1. For motor operated units, additional lock or latching mechanisms are not required.
2. Latch Handle: Manufacturer's standard.

2.04 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
1. Provide interlock switches on motor operated units.

B. Electric Operators:
1. Mounting: Side mounted.
2. Motor Enclosure:
3. Motor Rating: 1/3 HP; continuous duty.
4. Motor Voltage: 120 volts, single phase, 60 Hz.
5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
6. Controller Enclosure: NEMA 250, Type 4.
7. Opening Speed: 12 inches per second.
8. Brake: Manufacturer's standard type, activated by motor controller.

9. Manual override in case of power failure.
10. See Section 26 27 17 for electrical connections.

C. Control Station: Provide standard three button, "Open-Close-Stop" momentary-contact control device for each operator complying with UL 325.
   1. 24 volt circuit.
   2. Surface mounted, at interior door jamb.
   3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
      a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.

D. Safety Edge: Located at bottom of coiling door, full width, electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that adjacent construction is suitable for door installation.

B. Verify that electrical services have been installed and are accessible.

C. Verify that door opening is plumb, header is level, and dimensions are correct.

D. Notify Architect of any unacceptable conditions or varying dimensions.

E. Commencement of installation indicates acceptance of substrate and door opening conditions.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Section 26 27 17.

F. Complete wiring from disconnect to unit components.

G. Install enclosure and perimeter trim.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

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SECTION 08 42 29
AUTOMATIC ENTRANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sliding-type, bullet-resistant, packaged, power-operated door assemblies.

1.02 RELATED REQUIREMENTS

1.03 DEFINITIONS

A. AAADM: American Association of Automatic Door Manufacturers.

1.04 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. Underwriters Laboratories (UL):
   1. UL 325 – Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.
   2. UL 752 – Standard for Bullet Resisting Equipment.

C. American National Standards Institute (ANSI) / Builders' Hardware Manufacturers Association (BHMA):
   1. ANSI/BHMA A156.10: Standard for Power Operated Pedestrian Doors.
   2. ANSI/BHMA A156.5: Standard for Auxiliary Locks and Associated Products

D. American Society for Testing and Materials (ASTM):
   1. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
   3. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
   4. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
   5. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

E. American Association of Automatic Door Manufacturers (AAADM):

F. National Fire Protection Association (NFPA):
   1. NFPA 101 – Life Safety Code.
   2. NFPA 70 – National Electric Code.

G. International Organization for Standardization (ISO):
   1. ISO 9001 - Quality Management Systems

H. National Association of Architectural Metal Manufacturers (NAAMM):
   1. Metal Finishes Manual for Architectural and Metal Products.

I. American Architectural Manufacturers Association (AAMA):
   1. AAMA 607.1 - Clear Anodic Finishes for Architectural Aluminum.
   2. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.
   3. AAMA 701 Voluntary Specification for Pile Weatherstripping and Replaceable Fenestration Weatherseals.

1.05 DEFINITIONS

A. Activation Device: Device that, when actuated, sends an electrical signal to the door operator to open the door.

B. Safety Device: Device that prevents a door from opening or closing, as appropriate.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.

C. Shop Drawings: Include plans, elevations, sections, details, hardware mounting heights, and attachments to other work.

D. Engineering Calculations: When required by the architect, submit engineering calculations and supporting product data as required to confirm compliance with 1.05 Performance Requirements. Calculations shall be prepared in accordance with common, accepted engineering practice and shall conform to appropriate design rules of the referenced standards and building ordinances. All documents are to bear the seal of a licensed engineer. Calculations shall include:
   1. Material specifications and properties.
   2. The derivation of member properties.
   3. Analyses of stress and deflections for all structural elements, connections and anchorages.
   4. Dimensioned drawings of extrusion shapes where required to support calculations
   5. Safety Factors

E. Color Samples for selection of factory-applied color finishes.

F. Closeout Submittals:
   1. Owner's Manual.
   2. Warranties.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience, and a member of AAADM.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years documented experience and approved by manufacturer.

C. Certifications: Automatic sliding door systems shall be certified by the manufacturer to meet performance design criteria in accordance with the following standards:
   1. ANSI/BHMA A156.10.
   2. NFPA 101.
   3. Underwriter's Laboratories Listings:
      a. UL 325
      b. UL 752

D. Source Limitations: Obtain automatic entrance door assemblies through one source from a single manufacturer.

1.08 COORDINATION

A. Templates: Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing automatic entrances to comply with indicated requirements.

B. Electrical System Roughing-in: Coordinate layout and installation of automatic entrance door assemblies with connections to power supplies, remote activation devices, and security access control system. See Division 28 for controls not provided under this section.

C. System Integration: Integrate sliding automatic entrances with other systems as required for a complete working installation.
   1. Provide electrical interface control capability for operation of sliding automatic entrances by secure activation system on doors with electric locking.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for material and workmanship. Complete forms in Owner's name and register with manufacturer.

C. Extended Correction Period: Correct defective work within 5-year period commencing on Date of Substantial Completion.

D. During the warranty period the Owner shall engage a factory-trained technician to perform service and affect repairs. A safety inspection shall be performed after each adjustment or repair and a completed inspection form shall be submitted to the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sliding-type, Bullet-Resistant, Packaged, Power-Operated Door Assemblies.
   1. Basis-of-Design: Insulgard Security Products, 44/350 Architectural Aluminum Sliding Door System.
   2. Available Manufacturers: Subject to compliance with drawings and specifications, products from the following manufactures may be provided.
      a. Stanley Access Technologies; Dura-Shield Blast: www.stanleyaccess.com/#sle.;
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. General: Provide automatic entrance door assemblies capable of withstanding structural loads and thermal movements based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Thermal Movements: Provide automatic entrances that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

C. Operating Range: Minus 30 deg F (Minus 34 deg C) to 130 deg F (54 deg C).

D. Opening-Force Requirements for Egress Doors: Not more than 50 lbf (222 N) required to manually set door in motion if power fails, and not more than 15 lbf (67 N) required to open door to minimum required width.

E. Closing-Force Requirements: Not more than 30 lbf (133 N) required to prevent door from closing.

F. Sliding automatic entrances specified with automatic locking shall be designed to function as follows:
   1. Entrances shall be normally closed and locked by automatic locking system with exterior motion activation system disabled. Interior motion activation system to remain enabled; free egress.
   2. Upon signal from exterior secure activation device, sliding automatic entrances will unlock and open enabling motion activation system. Entrance will be held open as long as an object or pedestrian remains in the activation or safety zones.
   3. Once all activation and safety zones have cleared the entrance will close and re-lock, returning to normal state.
   4. At any time during the cycle emergency egress can be achieved by utilizing the emergency breakaway feature.

G. Structural properties of sliding automatic entrances:
   1. Design Pressures:
      a. Positive (inward) design pressure of 45 psf (2155 Pa)
      b. Negative (outward) design pressure of 45 psf (2155 Pa)
   2. Deflection limitations
      a. The deflection of any framing member in a direction normal to the plane of the wall when subjected to the specified design loads shall not exceed l/175 of its clear span or 3/4 inch (19 mm) whichever is less.

b. For cantilevers, the span shall be taken as two times the distance between anchor centerline and end of cantilever.
c. The deflection shall not exceed 50% of the nominal joint width at sealant joints occurring between framing members and relatively stiff building elements, or less if required by sealant manufacturer.
d. Upon reversal of load direction at magnitudes up to and including 1.5 times design pressures, slippage at fastened and/or clamped connections shall not exceed 1/8 inch (3 mm).
e. Glass deflection at full design load shall not exceed 1/100 of its span, or 3/4 inch (19 mm) whichever is less.
f. Metal panel deflection shall not exceed 1/90 of its span or 3/4 inch (19 mm) whichever is less. The span shall be taken as the lesser of the distances between the horizontal or vertical support members.

3. Structural design criteria and testing requirements.
a. The work shall be designed to withstand the design loads and pressures specified herein. Compliance shall be demonstrated by calculations performed in accordance with accepted engineering practice.
b. The work shall be designed to conform to ASTM E 330. Inward and outward acting test pressures shall be equal to 1.5 times the inward and outward acting design pressures to demonstrate a safety factor of 1.5 design pressures. Satisfactory performance at these loads shall mean no glass breakage, no permanent damage to fasteners or anchors, hardware, parts or actuating mechanisms; no malfunction of windows; no permanent deformation of main framing members in excess of 0.2% of their clear span.

H. Air Infiltration: The work shall be designed to conform to ASTM E 283. Differential static pressure shall be 6.24 psf (299 Pa). Any chamber leakage shall be accurately determined, not estimated. Air leakage of the fixed wall area shall not exceed 0.06 cfm (1.7 l/m) per 1 sf (929 scm) of exterior surface.

I. Water penetration
1. The system shall be designed to conform to ASTM E 331 using a static pressure differential of 8 psf (383 Pa).
2. Water penetration, in this specification, is defined as the appearance of uncontrolled water, other than condensation, on the indoor face of any part of the work.
3. Provision shall be made to weep any water entering the system, other than condensation, to the exterior of the window.

J. Light transmission & values of clear vision ballistic glazing (SP1250). The glazed vision areas should meet the following requirements:
1. Light transmittance, average daylight: 67 clear
2. Calculated shading coefficient: 0.90 clear
3. Nominal thickness: 1 1/4 inch (32 mm)
4. Unit Weight: 8.1 lbs/sf (39.6 Kg/sm).

K. The glazed framing system and its anchorage shall be designed to withstand normal recognized testing criteria to accept seismic movement without structural failure or glass breakage.

L. Ballistic Rating
1. The complete system, framing, glazing and panels is designed to comply with Underwriters Laboratories UL 752 specification to provide complete ballistic protection up to a level 3 rating (.44 magnum lead semi-wad-cutter gas checked)

2.03 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Headers, stiles, rails, and frames: 6063-T6, 6063-T5
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Sheet and Plate: ASTM B 209.

B. Sealants and Joint Fillers: Performed under Division 7 Section "Joint Sealants".

2.04 AUTOMATIC ENTRANCE DOOR ASSEMBLIES

A. General: Provide manufacturer's standard automatic entrance door assemblies including doors, side lites, framing, headers, carrier assemblies, roller tracks, door operators, activation and safety devices, and accessories required for a complete installation.

B. Sliding Automatic Entrances:
   1. Bi-Parting sliding doors:
      a. Configuration: Two sliding leaves and two full side lites.
      b. Traffic Pattern: Two-way.
      c. Emergency Breakaway Capability: Required.
      d. Mounting: Between jambs.

2.05 COMPONENTS

A. Framing Members: Manufacturer's standard extruded aluminum reinforced as required to support imposed loads.
   1. Nominal Size: 2 1/2 inch by 6 inch (63.5 mm by 152.4 mm).

B. Stile and Rail Doors and Sidelites: Manufacturer's standard 2 3/8 inch (60.3 mm) thick glazed doors with extruded-aluminum tubular stile and rail members. Incorporate concealed tie-rods that span full length of top and bottom rails or mechanically fasten corners with reinforcing brackets that are welded.
   1. Glazing Stops and Gaskets: Extruded-security aluminum stops and gaskets.
   2. Stile Design: Narrow stile; 2 3/4 inch (70 mm) nominal width.
   3. Top Rail Design: 2 3/4 inch (70 mm) nominal height
   4. Bottom Rail Design: Standard 8 1/2 inch (216 mm) nominal height.
   5. Muntin Bars: Horizontal tubular rail member for each door; 1 5/8 inch (41 mm) nominal height.

C. Glazing: Provide glazing for sliding automatic entrances; UL Level 3 Bullet Resistant BALULN25 Glazing Material, unless otherwise specified.

D. Headers: Fabricated from extruded aluminum and extending full width of automatic entrance door units to conceal door operators, carrier assemblies, and roller tracks. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.
   1. Mounting: Surface applied to structural framing system.
   2. Capacity: Capable of supporting doors up to 400 lb (182 kg) per leaf over spans up to 14 feet (4.3 m) without intermediate supports.

E. Carrier Assemblies and Overhead Roller Tracks: Manufacturer's standard carrier assembly that allows vertical adjustment of at least 1/8 inch; consisting of urethane with precision steel lubricated ball-bearing wheels, operating on a continuous roller track. Support doors from carrier assembly by 2 inch diameter anti-riser wheels with factory adjusted cantilever and pivot assembly. Minimum four ball-bearing roller wheels and two anti-rise rollers for each active leaf.
   1. Minimum Load Wheel Diameter: 2 1/2 inch (64 mm).

F. Thresholds: Manufacturer's standard thresholds as indicated below:
   1. Standard extrusion track under side lites.
   2. All thresholds to conform to details and requirements for code compliance.

G. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

H. Signage: Provide signage in accordance with ANSI/BHMA A156.10.

2.06 DOOR OPERATORS

A. General: Provide door operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, operation under normal traffic load for type of occupancy indicated.

B. Electromechanical Operators: Two (2) self-contained overhead units, 1/4 horsepower minimum, permanent-magnet DC motors with gear reduction drives, microprocessor controller; and encoder.
   1. Operation: Power opening and power closing.
   2. Features:
      a. Adjustable opening and closing speeds.
         1) Adjustable back-check and latching.
         2) Adjustable braking.
         3) Adjustable hold-open time between 0 and 30 seconds.
         4) Obstruction recycle.
         5) On/Off switch to control electric power to operator.
         6) Energy conservation switch that reduces door-opening width.
         7) Variable rate open/closed speed control.
         8) Closed loop speed control with active braking and acceleration.
         9) Variable obstruction recycle time delay.
         10) Self adjusting stop position.
         11) Self adjusting closing compression force.
         12) Optional Switch to open/Switch to close operation.
   3. Mounting: Concealed.
   4. Drive System: Synchronous belt type.

C. Electrical service to door operators shall be provided under Division 16 Electrical. Minimum service to be 120 VAC, 10 amps.

2.07 ELECTRICAL CONTROLS

A. Electrical Control System: Electrical control system shall include a microprocessor controller and position encoder. The encoder shall monitor revolutions of the operator shaft and send signals to microprocessor controller to define door position and speed. Systems utilizing external magnets and magnetic switches are not acceptable. A single controller shall be capable of controlling up to two (2) operators per entrance system.

B. Life Cycle Data Counter: The electrical control system shall incorporate a non-re-settable counter to track door operation cycles.

C. Controller Protection: The microprocessor controller shall incorporate the following features to ensure trouble free operation:
   1. Automatic Reset Upon Power Up.
   2. Main Fuse Protection.
   3. Electronic Surge Protection.
   4. Internal Power Supply Protection.
   5. Re-setable sensor supply fuse protection.
   6. Software “Watchdog” protection in the case of software malfunction.

D. Soft Start/Stop: A “soft-start” “soft-stop” motor driving circuit shall be provided for smooth normal opening and recycling.

E. Safety Search Circuitry: Provide system to recycle the sliding panels when an obstruction is encountered during the closing cycle. If an obstruction is detected, the system shall search for that object on the next closing cycle by reducing door closing speed prior to the previously encountered obstruction location, and will continue to close in check speed until doors are fully closed, at which time the doors will reset to normal speed. If obstruction is encountered again, the door will come to a full stop. The doors shall remain stopped until obstruction is removed and operate signal is given, resetting the door to normal operation.

F. Programmable Controller: Microprocessor controller shall be programmable and shall be designed for connection to a local configuration tool. Local configuration tool shall be software driven and shall be utilized via Palm® handheld interface. The following parameters may be adjusted via the configuration tool.
   1. Operating speeds and forces as required to meet ANSI/BHMA A156.10.

2. Adjustable and variable features as specified in 2.05, B., 2.
3. Reduced opening position.
4. Fail Safe/Secure control.
5. Firmware update.
6. Trouble Shooting
   a. I/O Status.
   b. Electrical component monitoring including parameter summary.
7. Entrance profile copy/paste.
8. Software for local configuration tool shall be available as a free download from the sliding automatic entrance manufacturer's internet site.

2.08 ACTIVATION AND SAFETY DEVICES

A. Motion Sensors: Motion sensors shall be mounted on each side of door header to detect pedestrians in the activating zone, and to provide a signal to open doors in accordance with ANSI/BHMA A156.10. Units shall be programmable for bi-directional or uni-directional operation and shall incorporate K-band microwave frequency to detect all motion in both directions.

B. Presence Sensors: Presence sensors shall be provided to sense people or objects in the threshold safety zone in accordance with ANSI/BHMA A156.10. Units shall be self-contained, fully adjustable, and shall function accordingly with motion sensors provided. The sensor shall be enabled simultaneously with the door-opening signal and shall emit an elliptical shaped infrared presence zone, centered on the doorway threshold line. Presence sensors shall be capable of selectively retuning to adjust for objects which may enter the safety zone; tuning out, or disregarding, the presence of small nuisance objects and not tuning out large objects regardless of the time the object is present in the safety zone. The door shall close only after all sensors detect a clear surveillance field.

C. Photoelectric Beams: In addition to the threshold sensor include a minimum of two (2) doorway holding beams. Photoelectric beams shall be pulsed infrared type, including sender receiver assemblies for recessed mounting.

2.09 HARDWARE

A. General: Provide units in sizes and types recommended by automatic entrance door and hardware manufacturers for entrances and uses indicated.

B. Deadlocks: Manufacturer's standard deadbolt operated by exterior cylinder and interior thumb turn; with minimum 1 inch (25 mm) long throw bolt; ANSI/BHMA A156.5, Grade 1.
   1. Cylinders: As specified in Division 8 Section "Door Hardware."
   2. Hook Latch: Laminated-steel hook, mortise type, BHMA A156.5, Grade 1.

C. Automatic Locking System: Provide automatic locking hardware on designated doors described as follows:
   1. System shall include a fail-secure electric solenoid locking device with a self contained solid state electronic control factory mounted inside the header.
   2. The automatic sliding door(s) shall self latch in the closed position preventing door panels from sliding manually, returning the system to its locked status.
   3. During a power interruption:
      a. The solenoid lock shall be engaged, preventing the doors from sliding manually.
      b. Means of egress shall be accomplished by standard emergency breakaway feature.

D. Fly Open Box: Provide Fly Open Box on designated doors in accordance with the following:
   1. Fly Open Box shall be a fully integrated unit designed to fit within the door header and shall be UL listed for operation with the sliding automatic entrances provided herein.
   2. Upon main power interruption to the door:
      a. The Fly Open Box shall supply power to the operator of the sliding automatic entrance door.
         1) The Fly Open Box shall provide one open close operation.
   3. Fly Open Box shall be configured for connection to a fire alarm system such that a signal from the fire alarm will open doors until fire alarm signal is terminated.

E. Control Switch: Provide manufacturer’s standard rotary switch mounted on the interior jamb to allow for full control of the automatic entrance door. Rotary switch shall be keyed on entrances with automatic locking. Controls to include, but are not limited to:
   1. Power On/Off
   2. One-way traffic
   3. Reduced Opening
   4. Open/Closed/Automatic

F. Sliding Weather Stripping: Manufacturer's standard replaceable components complying with AAMA 701; made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

G. Weather Sweeps: Manufacturer's standard adjustable nylon brush sweep mounted to underside of door bottom.

2.10 FABRICATION

A. General: Factory fabricates automatic entrance door assembly components to designs, sizes, and thickness indicated and to comply with indicated standards.
   1. Form aluminum shapes before finishing.
   2. Use concealed fasteners to greatest extent possible.
      a. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
      b. Reinforce members as required to receive fastener threads.

B. Framing: Provide automatic entrances as prefabricated assemblies.
   1. Fabricate tubular and channel frame assemblies with manufacturer's standard mechanical or welded joints. Provide sub-frames and reinforcement as required for a complete system to support required loads.
   2. Perform fabrication operations in manner that prevents damage to exposed finish surfaces.
   3. Form profiles that are sharp, straight, and free of defects or deformations.
   4. Prepare components to receive concealed fasteners and anchor and connection devices.
   5. Fabricate components with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.

C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.

D. Door Operators: Factory fabricated and installed in headers, including adjusting and testing.

E. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated.

F. Hardware: Factory install hardware to the greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site.

2.11 ALUMINUM FINISHES

A. General: Comply with NAAMM Metal Finishes Manual for Architectural and Metal Products for recommendations for applying and designing finishes. Finish designations prefixed by AA comply with system established by Aluminum Association for designing finishes.

B. Class I, Clear Anodic Finish: AA-M10C22A31 Mechanical Finish: as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.70 mils and salt spray 3000 hrs. minimum complying with AAMA 611-12, and the following:
   1. AAMA 607.1
   2. Applicator must be fully compliant with all applicable environmental regulations and permits, including wastewater and heavy metal discharge.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and dimensions are as indicated on shop drawings.

B. Verify that electric power is available, at the correct location, and is of the correct characteristics.

3.02 INSTALLATION

A. Install equipment in accordance with manufacturer's written instructions, except where more stringent requirements are specified.

B. General: Do not install damaged components. Fit frame joints to produce joints free of burrs and distortion. Rigidly secure non-movement joints.

C. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
   1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
   2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.

D. Door Operators: Connect door operators to electrical power distribution system as specified in Division 16 Sections.

E. Glazing: Glaze sliding automatic entrance door panels in accordance with, published recommendations of glass product manufacturer, and sliding automatic entrance manufacturer’s instructions.

F. Sealants: Comply with requirements specified in Division7 Section "Joint Sealants" to provide weather tight installation.

G. Install entrances securely anchored in place, plumb, level, and true to location, in alignment with established lines and grades, without warp, bow, or racking of members.

H. Where frames are assembled in field, fit frame joints hairline tight without burrs or distortion; rigidly secure nonmoving joints and seal watertight.

I. Provide for thermal expansion and contraction of door and frame units and live and dead loads that may be transmitted to operating equipment.

J. Provide for dimensional distortion of components during operation.

K. Coordinate installation of components with related and adjacent work; level and plumb.

3.03 FIELD QUALITY CONTROL

A. Testing Services: Factory Trained Installer shall test and inspect each automatic entrance door to determine compliance of installed systems with applicable ANSI standards.

3.04 ADJUSTING

A. Adjust door operators, controls, and hardware for smooth and safe operation, for weather-tight closure, and complying with requirements in ANSI/BHMA A156.10.

3.05 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Remove temporary protection; clean exposed surfaces.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 79 00 - Demonstration and Training for additional requirements.

B. Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.07 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Provide service and maintenance of operating equipment for two years from Date of Substantial Completion, at no extra charge to Owner.

END OF SECTION

SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

D. Door hardware.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 08 71 00 - Door Hardware: Hardware items other than specified in this section.

C. Section 08 80 00 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

C. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

F. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

G. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

H. FLA (PAD) - Florida Building Code Online - Product Approval Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting two weeks before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least twenty years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

1.07 MOCK-UPS

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Products of this section are to be included in full exterior wall construction mock-up panel as indicated on the drawings.
   1. Wall construction mock-up shall be utilized be utilized to confirm material and color selections.
   2. Wall construction mock-up shall demonstrate construction detail and quality and shall serve as benchmark for construction.
   3. Wall construction mock-up shall remain in place throughout construction of the building envelope and shall only be removed upon direction from the A/E.
   4. Locate mock-up where directed by Architect/Engineer.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.09 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.10 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide twewnty year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum-Framed Storefronts:
   1. Kawneer North America: www.kawneer.com/#sle.
   2. Oldcastle BuildingEnvelope: www.oldcastlebe.com/#sle.
   3. Tubelite, Inc: www.tubeliteinc.com/#sle.
   4. YKK AP America, Inc: www.ykkap.com/commercial/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING AND SINGLE PANE GLAZING

A. Center-Set Style, Wind-Borne-Debris Resistance Tested:
   1. Basis of Design: Kawneer, Trifab VersaGlaze 451T.
   2. Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.

2.03 BASIS OF DESIGN -- SWINGING DOORS

A. Wide Stile, Insulating Glazing, Thermally-Broken:
   1. Basis of Design: Kawneer, 500T Insulpour Thermal Entrance.
   2. Thickness: 2-1/4 inches.

2.04 BASIS OF DESIGN -- ALUMINUM FRAMED OPERABLE SASH

A. Outswing Casement Unit:
   1. Basis-of-Design: Kawneer, Glassvent Outswing Casement for Curtainwall
   2. System Depth: 3-7/16 inch.

2.05 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill and thermal break, and related flashings, anchorage and attachment devices.
   1. Glazing Rabbet: For 1 inch insulating glazing.
   2. Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
   3. Finish: Class I natural anodized.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
   4. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   5. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   7. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   8. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   9. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements
   1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
      a. Design Wind Loads: Comply with requirements of ASCE 7 and IBC 2021
      b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, having Florida Building Code "FLA (PAD)" approval for Large and Small Missile impact and pressure cycling at design wind pressure.
   3. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.

2.06 ALUMINUM FRAMED OPERABLE SASH

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.090" wall thickness at any location for the main frame and sash members.

B. Thermal Barrier: Low conductive polymer full depth of infill.

C. Insect Screen: Manufacturer's standard insect screen.

D. Hardware:
   1. Stainless Steel 4-Bar Hinges
   2. Cast white Bronze Cam Handle with Pole Ring

E. Operating Range: Outswing to 90 degrees.

2.07 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Glazing Stops: Flush.

B. Glazing: See Section 08 80 00.

C. Swing Doors: Glazed aluminum.

1. Thickness: 2 1/4 inches.
2. Top Rail: 5 inches wide.
3. Vertical Stiles: 5 inches wide.
4. Bottom Rail: 10 inches wide.
5. Glazing Stops: Square.
6. Finish: Same as storefront.

D. Operable Sash: Aluminum project-out awning; finished to match storefront; turn handle latch with manufacturer's standard insect screen.

2.08 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.09 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.10 HARDWARE

A. For each door, include weatherstripping, sill sweep strip, and threshold.

B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

C. Sill Sweep Strips: Resilient seal type, of neoprene; provide on all doors.

D. Threshold: Extruded aluminum, ADA compliant, one piece per door opening, ribbed surface; provide on all doors.

E. Hinges: Continuous type; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Install operating sash.

J. Set thresholds in bed of sealant and secure.

K. Install hardware using templates provided.
1. See Section 08 71 00 for hardware installation requirements.

L. Install glass and infill panels using glazing method required to achieve performance criteria; see Section 08 80 00.

M. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

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SECTION 08 56 53
SECURITY WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Security transaction windows.

1.02 RELATED REQUIREMENTS

A. Section 04 20 00 - Unit Masonry: Installation of anchorage items embedded in masonry.

B. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 12 36 23.13 - Ballistic Rated Countertops.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

E. SSPC-Paint 33 - Coal Tar Mastic Coating, Cold-Applied; 2006, with Editorial Revision (2015).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Furnish anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, to be embedded into concrete or masonry, with setting diagrams and installation, to applicable installer in time for installation.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's published data showing materials, construction details, dimensions of components, and finishes.

C. Shop Drawings: Drawings prepared specifically for this project, showing plans, elevations, sections, details of construction, anchorage to other work, hardware, and glazing.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements for additional provisions.
   2. Extra Security Fasteners: At least one box for every 50 boxes, or fraction thereof, of each type and size installed; provide products matching those installed, packaged and labeled.
   3. Tool Kit: 6 sets of tools for security fasteners.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm with at least ten experience in the manufacture of windows of the type specified and able to provide test reports showing that their standard manufactured products meet the specified requirements; custom designed products not acceptable.

B. Testing Agency Qualifications: Independent testing agency able to show experience in conducting tests of the type specified and:

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide manufacturer's warranty agreeing to repair or replace windows and window components that fail within three years after Date of Substantial Completion due to, but not limited to, the following:

1. Structural failure, failure of welds, and deterioration of metals and finishes beyond that expected under detention use and normal weathering.
2. Failure of glazing due to excessive deflection of supporting members under wind load.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Security Transaction Windows
   1. Basis of Design: Total Security Solutions; Hole and Backer Transaction Window with Integral Countertop and Deal Tray: www.tssbulletproof.com
   2. Quikserv: www.quikserv.com/#sle.
   3. Chicago Bullet Proof Systems: www.chicagobulletproof.com/#sle.
   4. National Bullet Proof, Inc: www.nationalbulletproof.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ASSEMBLIES

A. Security and Detention Windows:
   1. Dimensions, profiles, features, and performance specified and indicated on drawings are required; do not deviate unless specifically approved by Architect under substitution procedures; see Section 01 60 00.
   2. Design to fit openings indicated on drawings; design to accommodate deviation of actual construction from dimensions indicated on drawings.
   3. Fabricate frames and sash with corners mitered or coped full depth with concealed welded joints.
   4. Design anchorages to provide performance equivalent to that required for window unit; provide anchorages at least equivalent to those by which the tested units were anchored to the test frame.
   5. Separate dissimilar metals to prevent corrosion by galvanic action by painting contact surfaces with primer or with sealant or tape recommended by manufacturer for the purpose.
   6. Weld components before finishing and in concealed locations, to greatest extent possible; minimize distortion and discoloration of finish; remove residue of welding; grind exposed welds smooth and finish to match.
   7. Label units to indicate which side is which, such as inside/outside or secure/non-secure; use labels that are removable after installation but durable enough not to be lost during delivery, storage, handling, and installation.

2.03 BULLET RESISTANT HOLE AND BACKER TRANSACTION WINDOW

A. Product Description.
   1. The Hole and Backer System shall consist of custom prefabricated bullet resistant panels with secure air passage as required for voice transmission.
   2. System shall include aluminum frame with a plastic laminate base and recessed cash tray.
   3. All accessories required for installation shall be included.

B. Factory-applied finish:
   1. Clear Anodic Finish: Architectural Class I, clear coating AA-M10C22A41 Mechanical Finish Chemical Finish: etched, medium matte; 0.70 mils minimum complying with AAMA 611 "Voluntary Specification for Anodized Architectural Aluminum"

C. Bullet-Resisting Glazing Material:
   1. Bullet Resistant Level 1
      a. Bullet Resistant Level 3
         1) 1 1/4" LP 1250 Laminated

D. Cash tray: Provide Brushed Stainless Steel Counter Mounted.
   1. Cash tray shall be constructed of 18 gauge stainless steel, # 4 finish.
   2. Size: 16" x 8" from the outside edge of flanges with a clear opening.

E. Provide a shelf 1 1/2" thick with recessed cash tray.

1. Shelf shall be full width of window by 18" deep, centered under glazing and covered with stainless steel 18 ga. #4 finish.

F. Aluminum sections shall be manufactured in accordance with ASTM B209 and shall be extruded aluminum alloy 6063 T5 anodized finish and be free of sharp edges or burrs when in place.

G. Glazing Channel shall be a U-Channel specifically designed for securing glazing tightly in place.

H. Angles and shall only be acceptable for top attachment.

I. Frame shall be 18 ga. stainless steel.

J. The bottom of the glazing shall be capped with corresponding material on the frame.

2.04 ASSEMBLY COMPONENTS

A. Stainless Steel Framing: ASTM A666, Type 304; 14 gauge, 0.0781 inch minimum thickness.

B. Aluminum Framing: ASTM B221 (ASTM B221M) extrusions of alloy and temper selected by manufacturer for strength, corrosion resistance, and finish required; not less that 1/8 inch thick at any location of frame and sash members.

C. Frame Anchors: Mild steel plates, shapes, or bars, concealed in completed construction; provide anchorage devices as necessary to securely fasten windows to adjacent construction; use security fasteners for exposed anchors.
   1. For Setting in Masonry: Minimum 3/16 inch thick angles or plates, minimum 4 inches long with hooked ends, welded to back of window frame.
   2. Provide minimum of two anchors per side of window plus one additional anchor for each 18 inches or fraction thereof more than 36 inches in height or width.

D. Glazing Seals: Factory installed; molded EPDM or neoprene compressible gaskets and compression strips.

E. Security Fasteners: Operable only by tools produced by fastener manufacturer or manufacturer's licensee; head style appropriate to installation conditions, strength, and finish of materials being fastened; use countersunk heads wherever possible.

F. Bituminous Paint: Cold-applied asbestos-free asphalt mastic, complying with SSPC-Paint 33; 30 mils, 0.030 inch minimum thickness per coat.

G. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.05 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that window openings are ready for installation of windows.

B. Verify that correct embedded anchors are in place and in proper location; repair or replace anchors as required to achieve satisfactory installation.

C. Notify Architect if conditions are not suitable for installation of windows; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and drawing details.

B. Install windows in correct orientation (inside/outside or secure/non-secure).

C. Anchor windows securely in manner so as to achieve performance specified.

D. Separate metal members from concrete and masonry using bituminous paint.

E. Set sill members and sill flashing in continuous bead of sealant.

3.03 CLEANING

A. Clean exposed surfaces promptly after installation without damaging finishes.

B. Remove and replace defective work.

3.04 CLOSEOUT ACTIVITIES

A. Demonstrate operation and maintenance to designated Owner personnel.

END OF SECTION

SECTION 08 63 00
METAL-FRAMED SKYLIGHTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum skylight framing system.

B. Skylight glazing.

C. Fasteners, anchors, reinforcement, and flashings.

1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing: Structural support framing for system.

B. Section 07 53 00: Roofing system and base flashing at skylight curb.

C. Section 07 92 00 - Joint Sealants: Sealing joints between skylight frames and adjacent construction.

1.03 REFERENCE STANDARDS

A. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.

B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

D. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2013.

E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

G. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021.

H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

I. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

J. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).

K. ASTM C793 - Standard Test Method for Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants; 2023.

L. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).

M. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

N. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2023.

O. ASTM C1135 - Standard Test Method for Determining Tensile Adhesion Properties of Structural Sealants; 2019.

P. ASTM C1184 - Standard Specification for Structural Silicone Sealants; 2023.

Q. ASTM C1249 - Standard Guide for Secondary Seal for Sealed Insulating Glass Units for Structural Sealant Glazing Applications; 2018 (Reapproved 2023).

R. ASTM C1401 - Standard Guide for Structural Sealant Glazing; 2023.

S. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

T. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's specifications, standard details, and installation requirements.

C. Shop Drawings: Indicate framed opening requirements and tolerances, spacing of members, anticipated deflection under load, affected related work, expansion and contraction joint locations and details, and sizes and locations for field welding.
   1. Show field measurements on shop drawings.

D. Shop Drawings: Include details of proposed structural sealant glazing (SSG) and weather sealant joints indicating dimensions, materials, bite, thicknesses, profile, and support framing.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations.

G. Structural Glazing Adhesive: Product data and calculations showing compliance with performance requirements.

H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design skylight system under direct supervision of a professional engineer experienced in design of system type specified and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with not fewer than twenty years of documented experience.

C. Installer Qualifications: Company specializing in performing the type of work specified in this section with at least ten years of documented experience.

D. Verify that each component is appropriate for use in structural sealant glazing (SSG) application in regards to at least the following properties; size, shape, dimensions, material, shelf-life, storage conditions, and color.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide wrapping to protect prefinished aluminum surfaces. Do not use adhesive papers or spray coatings that bond when exposed to sunlight or weather.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work, including leaks, discoloration, failure of seal at insulated glazing units, and excessive thermal or structural movement, within a five year period after Date of Substantial Completion.

C. Manufacturer Warranty: Provide five-year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same. Include coverage for degradation of color finish. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design:
   1. Wasco Part of the Velux Group, Pinnacle, Extended Pyramid.

B. Available Metal-Framed Skylights Manufacturers: Subject to requirements of drawings and specifications, products from the following manufacturers may be provided.
   1. Kingspan Light + Air, LLC: www.kingspanlightandair.us/#sle.
   2. Oldcastle Building Envelope: www.obe.com/#sle.
   3. Surespan Limited: www.surespancovers.us/#sle.
   4. Wasco Skylights - Part of the VELUX Group: www.wascoskylights.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 METAL-FRAMED SKYLIGHTS

A. Metal Framed Skylights: Factory-fabricated, and glazed.
   1. Frame: Extruded aluminum structural members with integral condensation collection and guttering system thermally separated from exterior pressure bar.
   2. Glazing System: Pressure glazing bar system for sloped joints and two (2)-sided structural sealant glazing (SSG) for horizontal joints.
   3. Glazing: Insulating glass.
   4. Aluminum Finish: High performance organic coatings.
   5. Fabricate to prevent vibration harmonics, thermal movement transmitted to other building elements, and loosening, weakening, or fracturing of attachments or components of system.

2.03 PERFORMANCE REQUIREMENTS

A. Provide metal-framed skylights that comply with the following:
   1. Structural Design: Design and size components to withstand dead loads and specified live loads without damage or permanent set.
      a. See structural drawings for load criteria.
   2. Wind Loads: Test in accordance with ASTM E330/E330M, using loads 1.5 times the specified design pressures and 10 second duration of maximum load.
   3. Concentrated Load: Design to withstand 250 pounds concentrated load at any location on framing members without permanent set.
   4. Glazing Support Member Deflection Under Wind Load: 1/180 of span, maximum.
   5. Structural Glazing Adhesive: Design system to limit stress on structural glazing adhesive to 20 percent of tested tensile adhesion and maximum compression or elongation to 25 percent of neutral dimension.
   6. Thermal Movement: Design system to accommodate thermal expansion and contraction over ambient temperature range of 100 degrees F, dynamic loading and release of loads, creep of concrete structural members, and deflection of structural support framing without damage to skylight system components or loss of weathertightness.
   7. Air Leakage: 0.30 cfm/sq ft maximum leakage when tested at 1.57 psf pressure difference in accordance with ASTM E283/E283M.
   8. Structural Sealant Glazing (SSG) System: For individual glass lites, design framing members to not exceed a deflection normal to the wall of L/175 between supports with 3/4 inch maximum, and a deflection parallel to the wall of L/360 with 1/8 inch maximum, whichever is less.

2.04 MATERIALS

A. Aluminum Extrusions: Alloy and temper 6063-T5, 6063-T6, or 6061-T6 members complying with ASTM B221 (ASTM B221M), with minimum thickness 1/8 inch for structural members and 1/16 inch for non-structural members.

B. Formed Aluminum: Sheet material of alloy 5052, 5005, or 6061-T651 members complying with ASTM B209/B209M, with minimum thickness 1/8 inch for structural members and 1/16 inch for non-structural members.

C. Internal Reinforcement: ASTM A36/A36M; Steel shapes as required for strength and mullion size limitations, hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.

D. Insulating Glass: Sealed insulated units, outer pane of obscure, laminated glass; inner pane of clear transparent, laminated glass; space of sealed air, metal edge frame.

E. Glazing Accessories: As recommended by manufacturer of skylight system.

F. Structural Sealant Glazing (SSG) Adhesive: Neutral curing, silicone sealant formulated for SSG applications in compliance with ASTM C1184 and structural glazing industry guidelines, ASTM C1401.
   1. SSG adhesive in compliance with ASTM C920; Type M - Multicomponent, Grade NS, Class 50, Use NT, G, and A.
   2. Ultimate Tensile Strength: Minimum of 50 psi as determined by test method ASTM C1135 under the following conditions.
      a. Exposure to air temperatures of 190 degrees F and minus 20 degrees F.
      b. Water Immersion for seven (7) days, minimum.
      c. Exposure to weathering for 5,000 hours, minimum.
   3. Sealant Design Tensile Strength: 20 psi, maximum.
   4. Hardness: 20 to 60 with Type A-2 durometer in compliance with test method ASTM C661.
   5. SSG sealant tested for compatibility with glazing accessories in compliance with ASTM C1087, tested for accelerated weathering in compliance with ASTM C793, and in compliance with insulating glass secondary sealant design standards of ASTM C1249.

G. Weatherseal Sealant: Silicone, with adhesion in compliance with ASTM C794; compatible with glazing accessories.

H. Touch-Up Primer for Galvanized Steel Surfaces: Zinc rich type.

I. Fasteners: Stainless steel.

2.05 FABRICATION

A. Rigidly fit and secure joints and corners with screw and spline; fabricate rigid joints with connections that are flush, hairline, and weatherproof.

B. Fabricate components to allow for expansion and contraction with minimum clearance and shim spacing around perimeter of assembly.

C. Drain to exterior any water entering exterior joints, condensation occurring in glazing channels, or migrating moisture occurring within system.

D. Prepare components to receive concealed anchorage devices, and ensure that fasteners will be concealed upon completion of installation.

2.06 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick; exterior surfaces only.

B. High Performance Organic Coatings: AAMA 2604; multiple coats, thermally cured fluoropolymer system; interior surfaces only.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that structural curb is ready to receive skylight system. Coordinate installation of roofing and other adjacent work to ensure weathertight construction.

3.02 INSTALLATION

A. Install metal-framed skylights in accordance with manufacturer's instructions.

B. Set skylight structure plumb, level, and true to line, without warp or rack of frames or glazing panels. Anchor securely in place in accordance with approved shop drawings.

C. Maintain assembly dimensional tolerances, aligning with adjacent work.

D. Install base flashings in accordance with Section 07 62 00.

E. Touch up damaged finishes so repair is imperceptible from 6 feet distance, and remove and replace components that cannot be acceptably touched up.

3.03 TOLERANCES

A. Maximum Variation from Plumb, Level, or Line: 1/8 inch per 10 feet, or 3/8 inch total in overall dimension.

B. Alignment of Two Adjoining Members Abutting in Plane: Within 1/16 inches.

3.04 FIELD QUALITY CONTROL

A. Provide services of metal-framed skylight manufacturer's field representative to observe for proper installation of system and submit report.

B. See Section 01 40 00 - Quality Requirements for general testing and inspection requirements.

C. Water-Spray Test: Provide water spray quality test of installed metal-framed skylight components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
   1. Perform a minimum of two tests in each designated area as indicated on drawings.

D. Repair or replace metal-framed skylight components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 CLEANING

A. Upon completion of installation, thoroughly clean skylight aluminum surfaces in accordance with AAMA 609 & 610.

B. Remove protective material from prefinished aluminum surfaces.

C. Wash down exposed surfaces; wipe surfaces clean.

D. Remove excess sealant by methods recommended by skylight manufacturer.

END OF SECTION

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SECTION 087100

DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Sliding doors.
3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
4. Division 28 Section “Access Control Hardware Devices”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.
    c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Proof of Certification: Provide copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider of the primary Integrated Wiegand Access Control Products.

E. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

F. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check

Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

a. Two Hinges: For doors with heights up to 60 inches.
b. Three Hinges: For doors with heights 61 to 90 inches.
c. Four Hinges: For doors with heights 91 to 120 inches.
d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

    a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

    a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.

5. Manufacturers:

    a. Hager Companies (HA) - BB Series, 5-knuckle.
    b. Ives (IV) - 5BB Series, 5-knuckle.
    c. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.2 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

    a. Hager Companies (HA).
    b. Ives (IV).
    c. Pemko (PE).

2.3 SLIDING AND FOLDING HARDWARE

A. Sliding and Folding Door Hardware: Hardware is to be of type and design as specified and should conform with ANSI/BHMA A156.14.

1. Pocket Sliding Door Hardware: Rated for doors weighing up to 200 lb.
2. Manufacturers:

    a. Hafele Manufacturing (HF).
    b. Pemko (PE).

2.4 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets with a 1-year warranty. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Hager Companies (HA) - ETW-QC (# wires) Option.
b. Ives (IV) - Connect.
c. McKinney (MK) - QC (# wires) Option.

B. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Pemko (PE) - EL-CEPT Series.
b. Securitron (SU) - EL-CEPT Series.
c. Von Duprin (VD) - EPT-10 Series.

C. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

a. McKinney (MK) - QC-C Series.
b. Schlage (SC) - Connect.
c. Von Duprin (VD) - Connect.

2.5 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:

a. Burns Manufacturing (BU).
b. Rockwood (RO).

c. Trimco (TC).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:

a. Burns Manufacturing (BU).
b. Rockwood (RO).
c. Trimco (TC).

2.6 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

1. Manufacturers:

a. Sargent Manufacturing (SA).
b. No Substitution.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Match Facility Standard.

C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.

2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

F. Construction Keying: Provide construction master keyed cylinders.

G. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.7 KEY CONTROL

P. Electronic Key Management System: Provide an electronic key control system with Stand-alone Plug and Play features including advanced RFID technology. Touchscreen interface with PIN access for keys individually locked in place. Minimum 1,000 system users and 21 iFobs for locking receptors. System shall have a minimum 250,000 audit events screen displayed or ability to be exported via USB port.

1. Manufacturers:

a. Medeco (MC).
b. Traka (TA).

2.8 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - ML2000 Series.
b. Sargent Manufacturing (SA) - 8200 Series.
c. Schlage (SC) - L9000 Series.

2.9 DEADLOCKS AND LATCHES

A. Narrow Case Deadlocks and Deadlatches: ANSI/BHMA 156.13 Series 1000 Grade 1 narrow case deadlocks and deadlatches for swinging or sliding door applications. All functions shall be manufactured in a single sized case formed from 12 gauge minimum, corrosion resistant steel (option for fully stainless steel case and components). Provide minimum 2 7/8" throw laminated stainless steel bolt. Bottom rail deadlocks to have 3/8” diameter bolts.

1. Manufacturers:

a. Adams Rite Manufacturing (AD) - MS1850S / MS1950 Series.

2.10 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.11 ELECTRIC STRIKES

A. Standard Electric Strikes: Electric strikes conforming to ANSI/BHMA A156.31, Grade 1, for use on non-rated or fire rated openings. Strikes shall be of stainless steel construction tested to a minimum of 1500 pounds of static strength and 70 foot-pounds of dynamic strength with a minimum endurance of 1 million operating cycles. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified. Where specified provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.

1. Manufacturers:

a. HES (HS) - 1500/1600 Series.

B. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.12 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide exit devices with functions and features as follows:

    a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
    b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
    c. No catch points: addition of applied deflectors or other added components are not allowed.
    d. No visible plastic.
    e. Heavy duty end caps with flush and overlapping options made of stainless steel, brass, or bronze with architectural finishes.
    f. Constructed of all stainless steel.
    g. Stainless steel pullman type latch with deadlock feature.
    h. Narrow or wide style exterior trim as specified in the hardware sets.
    i. Center case adjustability on concealed vertical rod exit devices; single operation with hex key individually adjusts top or bottom latches. No retainer screws or clips required to maintain adjustment.
    j. Ten-year limited warranty for mechanical features.

2. Electromechanical exit devices shall have the following functions and features:

    a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
    b. Wire routing for all non-access control electromechanical functions and EcoFlex trim to be contained within the carrier of the device eliminating the need for cavities

in doors to be drilled. Include a protective film so that wires don't get damaged if the rail needs to be removed.

c. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
d. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
e. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.

3. Manufacturers:

a. Corbin Russwin Hardware (RU) - PED4000 / PED5000 Series.
b. Sargent Manufacturing (SA) - PE80 Series.
c. Von Duprin (VD) - 35A/98 XP Series.

2.13 SURFACE DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.

2. Manufacturers:

a. Corbin Russwin Hardware (RU) - DC6000 Series.
b. LCN Closers (LC) - 4040 Series.
c. Norton Rixson (NO) - 7500 Series.
d. Sargent Manufacturing (SA) - 351 Series.

2.14 SURFACE MOUNTED CLOSER HOLDERS

A. Electromagnetic Door Holders: ANSI A156.15 electromagnetic door holder/releases with a minimum 20 to 40 pounds holding power and single coil construction able to accommodate.12VDC, 24VAC, 24VDC and 120VAC. Coils to be independently wound, employing an integral fuse and armatures to include a positive release button.

1. Manufacturers:

a. LCN Door Closers (LC) - SEM7800 Series.
b. Norton Rixson (RF) - 980/990 Series.
c. Sargent Manufacturing (SA) - 1560 Series.

2.15 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:

a. Burns Manufacturing (BU).
b. Rockwood (RO).
c. Trimco (TC).

2.16 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

a. Burns Manufacturing (BU).
b. Rockwood (RO).
c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

a. Norton Rixson (RF).
b. Rockwood (RO).
c. Sargent Manufacturing (SA).

2.17 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. National Guard Products (NG).
2. Pemko (PE).
3. Reese Enterprises, Inc. (RE).

2.18 ELECTRONIC ACCESSORIES

A. Push-Button Switches: Industrial grade momentary or alternate contact, back-lighted push buttons with stainless-steel switch enclosures. 12/24 VDC bi-color illumination suitable for either flush or surface mounting.

1. Manufacturers:

a. Alarm Controls (AK) - TS Series.
b. Securitron (SU) - PB Series.

B. Wiegand Test Unit: Test unit verifies proper Wiegand output integrated card reader lock installation in the field by testing for proper wiring, card reader data integrity, and lock functionality including lock/unlock, door position, and request-to-exit status. 12 or 24VDC voltage adjustable operating as Fail Safe or Fail Secure.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - WT2 Wiegand Test Unit.
b. Sargent Manufacturing (SA) - WT2 Wiegand Test Unit.

C. Switching Power Supplies: Provide power supplies with either single or dual voltage configurations at 12 or 24VDC. Power supplies shall have battery backup function with an integrated battery charging circuit and shall provide capability for power distribution, direct lock control and Fire Alarm Interface (FAI) through add on modules. Power supplies shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs.

1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
2. Manufacturers:

a. Securitron (SU) - AQD Series.

D. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multi-voltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.

1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
2. Manufacturers:

a. Securitron (SU) - AQL Series.

2.19 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.20 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.

3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Plastic films.

D. Ballistic resistant glazing systems.

E. Laminated glass interlayers.

F. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 08 11 13 - Hollow Metal Doors and Frames.

B. Section 08 14 16 - Flush Wood Doors.

C. Section 08 42 29 - Automatic Entrances.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

C. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).

E. ASTM C1036 - Standard Specification for Flat Glass; 2011.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.

H. ASTM C1349 - Standard Specification for Architectural Flat Glass Clad Polycarbonate; 2017.

I. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.

J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

K. GANA (GM) - GANA Glazing Manual; 2009.

L. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2017.

M. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014, with Errata (2017).

N. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2017.

O. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements.

B. Product Data on Insulating Glass Unit, Glazing Unit, and Plastic Film Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12 by 12 inch in size of glass units.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM) for glazing installation methods. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum twenty years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least ten years documented experience.

1.07 MOCK-UPS

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Products of this section are to be included in full exterior wall construction mock-up panel as indicated on the drawings.
   1. Wall construction mock-up shall be utilized be utilized to confirm material and color selections.
   2. Wall construction mock-up shall demonstrate construction detail and quality and shall serve as benchmark for construction.
   3. Wall construction mock-up shall remain in place throughout construction of the building envelope and shall only be removed upon direction from the A/E.
   4. Locate mock-up where directed by Architect/Engineer.

1.08 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:
   1. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com/#sle.
   2. Guardian Industries Corp; www.sungardglass.com.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Float Glass Manufacturers:

1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
2. Guardian Glass, LLC: www.guardianglass.com/#sle.
3. Pilkington North America Inc: www.pilkington.com/na/#sle.
4. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

C. Laminated Glass Manufacturers:
1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
2. Viracon, Architectural Glass segment of Apogee Enterprises, Inc; _____: www.viracon.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
1. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
2. Design Pressure: Calculated in accordance with ASCE 7 and IBC 2021.
a. Risk Category III.
b. Exposure Category C.
c. Basic Design Wind Speed: 125 mph.
3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
4. Glass thicknesses listed are minimum.

B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
1. In conjunction with vapor retarder and joint sealer materials described in other sections.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
4. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality - Q3, with color and performance characteristics as indicated.
5. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.
2. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch thick, minimum.

2.04 INSULATING GLASS UNITS

A. Manufacturers:

1. Glass: Any of the manufacturers specified for float glass.
2. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
3. Guardian Glass, LLC: www.guardianglass.com/#sle.
4. Pilkington North America Inc: www.pilkington.com/na/#sle.
5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.

B. Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Metal Edge Spacers: Aluminum, bent and soldered corners.
4. Spacer Color: Black.
5. Edge Seal:
   a. Single-Sealed System: Provide silicone sealant as seal applied around perimeter.
   b. Color: Black.
6. Purge interpane space with dry air, hermetically sealed.

C. Type GL-1 - Insulating Glass Units: Vision glass, double glazed.
1. Applications: Exterior glazing unless otherwise indicated.
2. Space between lites filled with argon.
3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
   a. Tint: Light Gray.
   b. Coating: SunGuard SNX 62/27, on #2 surface.
4. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
   a. Tint: Clear.
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value), Summer - Center of Glass:.24, nominal.
7. Visible Light Transmittance (VLT): 45 percent, nominal.
8. Solar Heat Gain Coefficient (SHGC):.22, nominal.

2.05 GLAZING UNITS

A. Type GL-2 - Monolithic Interior Vision Glazing:
1. Applications: Interior glazing unless otherwise indicated.
2. Glass Type: Fully tempered float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.
5. Glazing Method: Dry glazing method, gasket glazing.

B. Type GL-3 - Safety glass: Laminated glass, 2-Ply.
1. Applications: Locations as indicated on drawings.
2. Tint: Clear.
3. Thickness: 1/4 inch - 0.030 interlayer - 1/4 inch.
4. Outer Lite: Annealed glass.
5. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
6. Inside Lite: Annealed glass.

C. Type GL-4 - Glass-Clad Polycarbonate Security Glazing: Laminated glass and polycarbonate, 2-Ply; ASTM C1349.
1. Applications: Entry Lobby interior and exterior sliding door assembly, door to administration suite, and pass window.
2. Tint: Clear.
3. Thickness: As required to meet performance criteria.
4. Outer Lite: Tempered glass.
5. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
6. Inside Lite: Polycarbonate.
7. Performance Criteria:

a. Bullet Resistance: Pass UL 752 tests in compliance with ballistic criteria level and weapon description indicated; Level 3 - .44 magnum lead semi-wadcutter gas checked.

2.06 PLASTIC FILMS

A. Solar Control Plastic Film: Mylar type.
   1. Application: Locations as indicated on drawings.
   2. Color: To be selected.
   3. Thickness Without Liner: 0.00236 inch.
   4. Manufacturers:
      a. 3M Window Films; Sun Control Window Film Traditional Series: solutions.3m.com/wps/portal/3M/en_US/Window_Film/Solutions/#sle.
      b. Flexvue Films: www.flexvuefilms.com/#sle.
      c. LLumar, an Eastman Chemical Company; Solar Control Window Film, LLumar or Vista: www.llumar.com/#sle.
      d. XPEL, Inc; EXTERIOR: www.xpel.com/#sle.

2.07 LAMINATED GLASS INTERLAYERS

A. Type LGI-1 - Polyvinyl Butyral (PVB) Interlayer for Laminated Glazing:
   1. Functionality: Post-breakage safety and security.
   2. Applications:
      a. Single pane, laminated glass unit, Type GL-3.
   3. Color: Clear.
   4. Thickness: As required for indicated performance of laminated glass application.

2.08 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

C. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 FIELD QUALITY CONTROL

A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

B. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove non-permanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

E. The window film may be washed using common window cleaning solutions, including ammonia solutions, 30 days after application. Abrasive type cleaning agents and bristle brushes, which could scratch the film, must not be used. Synthetic sponges or soft cloths are recommended.

3.07 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 09 05 61

COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.
   2. Carpet tile.
   3. Epoxy flooring system.

B. Preparation of new concrete floor slabs for installation of floor coverings.

C. Testing of concrete floor slabs for moisture and alkalinity (pH).

D. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

E. Patching compound.

F. Remedial floor coatings.

G. Adhesive and bond testing.

1.02 RELATED REQUIREMENTS

A. Section 01 74 19 - Construction Waste Management and Disposal: Handling of existing floor coverings removed.

1.03 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 1999 (Reapproved 2014).

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.

E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2011.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

C. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
   1. Manufacturer's qualification statement.
   2. **Certificate: Manufacturer's certification of compatibility with types of flooring applied over remedial product.**
   3. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
   4. Manufacturer's installation instructions.

5. Specimen Warranty: Copy of warranty to be issued by coating manufacturer and certificate of underwriter's coverage of warranty.

D. Testing Agency's Report:
1. Description of areas tested; include floor plans and photographs if helpful.
2. Summary of conditions encountered.
3. Moisture and alkalinity (pH) test reports.
4. Copies of specified test methods.
5. Recommendations for remediation of unsatisfactory surfaces.
6. Submit report not more than two business days after conclusion of testing.

E. Adhesive Bond and Compatibility Test Report.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.

B. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.

C. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.07 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
3. Products:
a. ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com/#sle.
b. H.B. Fuller Construction Products, Inc; TEC Feather Edge Skim Coat: www.tecspecialty.com/#sle.
c. LATICRETE International, Inc; SKIM LITE: www.laticrete.com/#sle.

d. USG Corporation; Durock Brand Advanced Skim Coat Floor Patch: www.usg.com/#sle.
e. Substitutions: See Section 01 60 00 - Product Requirements.

B. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
1. Product shall meet or exceed permeability performance requirements of ASTM F3010.
2. Thickness: As required for application and in accordance with manufacturer's installation instructions.
3. Use product recommended by flooring and adhesive manufacturers.
4. Products:
a. ARDEX Engineered Cements; ARDEX VB 100: www.ardexamericas.com/#sle.
b. Custom Building Products; TechMVC Moisture Vapor and Alkalinity Barrier: www.custombuildingproducts.com/#sle.
c. H.B. Fuller Construction Products, Inc; TEC LiquiDam with TEC Level Set 200 SLU: www.tecspecialty.com/#sle.
d. LATICRETE International, Inc; LATICRETE VAPOR BAN E with LATICRETE NXT LEVEL PLUS: www.laticrete.com/#sle.
e. Maxxon Corporation; Maxxon MVP One Primer: www.maxxon.com/#sle.
f. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
1. Prepare slab in accordance with the requirements of the remedial floor coating manufacturer.
2. Preliminary cleaning.
3. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
4. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
5. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
6. Seal cracks and joints as directed by remedial floor coating manufacturer
7. Specified remediation, applied in accordance with manufacturer instructions.
8. Patching, smoothing, and leveling, as required.
9. Other preparation specified.
10. Adhesive bond and compatibility test.
11. Protection.

B. Remediations:
1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.03 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.04 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A.
   1. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

D. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

E. Report: Report the information required by the test method.

3.05 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
   1. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.
   2. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.
   3. Use of a digital pH meter with probe is acceptable; follow meter manufacturer's instructions.

C. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.06 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Fill expansion joints, isolation joints, or other moving joints with compatible, flexible sealant approved by remedial floor coating manufacturer

3.07 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.08 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.09 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

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SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Cementitious backing board.

C. Gypsum wallboard.

D. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Structural steel stud framing.

B. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

C. Section 07 21 00 - Thermal Insulation: Acoustic insulation.

D. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).

B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).

C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.

D. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2014).

E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.

F. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.

G. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.

H. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.

I. ASTM C1325 - Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units; 2014.

J. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.

K. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2015.

L. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.

M. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

N. ASTM E413 - Classification for Rating Sound Insulation; 2010.

O. GA-216 - Application and Finishing of Gypsum Board; 2013.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data:

1. Provide data on metal framing, gypsum board, accessories, and joint finishing system.
2. Metal framing span tables with annotations indicated framing size, gauge, span, and deflection.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Member of Steel Stud Manufacturers Association (SSMA): www.ssma.com/#sle.

B. Manufacturer Qualifications: Company specializing in performing work of the type specified and with at least twenty years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least ten years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

C. Store metal products to prevent corrosion.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216 and as indicated on the drawings.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

2.02 METAL FRAMING MATERIALS

A. See section 05 40 00 - Cold-Formed Metal Framing.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company: www.americangypsum.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/#sle.
   3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
   4. Gold Bond Building Products, LLC provided by National Gypsum Company: www.goldbondbuilding.com/#sle.
   5. USG Corporation: www.usg.com/#sle.

B. Impact Resistant Wallboard:
   1. Application: Vertical surfaces.
   2. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
   3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
   4. Soft Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
   5. Hard Body Impact: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
   6. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   7. Paper-Faced Type: Gypsum wallboard, as defined in ASTM C1396/C1396M.
   8. Thickness: 5/8 inch.
   9. Edges: Tapered.

C. Backing Board For Wet Areas:
   1. Application: Surfaces behind tile in wet areas including restrooms.

2. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
   a. Thickness: 5/8 inch.
   b. Products:
      1) Custom Building Products: www.custombuildingproducts.com/#sle.
      2) PermaBASE Building Products, LLC provided by National Gypsum Company; PermaBase Cement Board: www.goldbondbuilding.com/#sle.
      3) USG Corporation; Fiberock Brand Aqua-Tough AR Interior Panels Regular 5/8 in. (15.9 mm): www.usg.com/#sle.
      4) Substitutions: See Section 01 60 00 - Product Requirements.

D. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Ceilings, unless otherwise indicated.
   2. Thickness: 1/2 inch.
   3. Edges: Tapered.

2.04 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: See Section 07 21 00.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
   2. Joint Compound: Setting type, field-mixed.

E. Finishing Compound: Surface coat and primer, takes the place of skim coating.

F. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

G. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

H. Nails for Attachment to Wood Members: ASTM C514.

I. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.
   2. Seal between base of gypsum board and floor.

3.03 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

D. Installation on Metal Framing: Use screws for attachment of gypsum board.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as follows:
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.05 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use fiberglass joint tape, embed with drying type joint compound and finish with drying type joint compound.

B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.
   2. Taping, filling, and sanding are not required at surfaces behind adhesive applied ceramic tile.

3.06 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.07 PROTECTION

A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION

SECTION 09 30 00
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for wall applications.

B. Stone thresholds.

C. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 07 90 05 - Joint Sealers.

C. Section 09 05 61 - Common Work Results for Flooring Preparation.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2017.
   1. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2017.
   2. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 2017.
   3. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement; 1999 (Reaffirmed 2016).
   4. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2009 (Revised).
   5. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
   6. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (Reaffirmed 2010).
   7. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2010).
   8. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2010).
   9. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017.
   10. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).
   11. ANSI A108.11-SystemDeleted - American National Standard for Interior Installation of Cementitious Backer Units; 2010 (Revised).
   12. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
   13. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2016).
   14. ANSI A118.1 - American National Standard Specifications for Dry-Set Cement Mortar; 2012 (Revised).
   15. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2012 (Revised).

16. ANSI A118.5 - American National Standard Specifications for Chemical Resistant Furan Mortars and Grouts for Tile Installation; 1999 (Reaffirmed 2016).
17. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2010 (Reaffirmed 2016).
18. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2010 (Reaffirmed 2016).
19. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).
20. ANSI A118.9-SystemDeleted - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2010).
21. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation; 2014.

B. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014.

C. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2012.

D. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2012.
   1. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2019.
   2. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018.

E. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Samples: Provide two sets of manufacturer's sample boards for each type of tile for initial selection.

E. Samples: Provide three full sizes sample units of each type of tile.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Tile: 10 square feet of each size, color, and surface finish combination.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum ten years of documented experience.

B. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.06 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect materials from freezing or overheating in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers: All products by the same manufacturer.
   1. American Olean Corporation: www.americanolean.com.
   2. Dal-Tile Corporation: www.daltile.com.
   3. Florida Tile: www.floridatile.com.
   4. Trinity Tile: www.trinitytile.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Ceramic Mosaic Tile: ANSI A137.1, standard grade.
   1. Size: 2 by 2 inch, nominal.
   2. Shape: Square.
   3. Edges: Square.
   4. Surface Finish: Matte glazed.
   5. Color(s): 3 color mosaic pattern.

C. Glazed Wall Tile: ANSI A137.1, standard grade.
   1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
   2. Size: 4-1/4 by 4-1/4 inch, nominal.
   3. Edges: Cushioned.
   4. Surface Finish: High gloss.
   5. Color(s): (4) Four colors to be selected by Architect from manufacturer's standard range.
   6. Basis of Design: Color Story Wall by American Olean.

D. Cove Base Glazed Wall Tile: ANSI A137.1, standard grade.
   1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
   2. Size: 4-1/4 by 4-1/4 inch, nominal.
   3. Edges: Cushioned.
   4. Surface Finish: High gloss.
   5. Color(s): (2) Two colors to be selected by Architect from manufacturer's standard range.
   6. Basis of Design: Color Story Wall by American Olean.

2.02 TRIM AND ACCESSORIES

A. Non-Ceramic Trim: Brushed stainless steel, style and dimensions to suit application, as indicated on drawings for setting using tile mortar or adhesive.
   1. Applications: Use in the following locations:
      a. Open edges of wall tile.
      b. Open edges of floor tile.
      c. Transition between floor finishes of different heights.
      d. Expansion and control joints, floor and wall.
      e. Floor to wall joints.
   2. Manufacturer:
      a. Schluter-Systems: www.schluter.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Thresholds: 4 inches wide by full width of wall or frame opening; beveled edge on both long edges; without holes, cracks, or open seams.
   1. Thickness: 1/2 inch.
   2. Material: Granite, honed finish.

3. Color and Pattern: Grey.

2.03 SETTING MATERIALS

A. Manufacturers:
   1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
   2. Bostik Inc: www.bostik-us.com/#sle.
   3. LATICRETE International, Inc: www.laticrete.com/#sle.

B. Improved Latex-Portland Cement Mortar Bond Coat: ANSI A118.15.
   1. Applications: Use this type of bond coat where indicated and where no other type of bond coat is indicated.
   2. Products:
      a. ARDEX Engineered Cements; S 28: www.ardexamericas.com/#sle.
      b. Custom Building Products; Complete Contact-LFT Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer: www.custombuildingproducts.com/#sle.
      c. LATICRETE International, Inc; LATICRETE 254 Platinum: www.laticrete.com/#sle.

2.04 ADHESIVE MATERIALS

A. Manufacturers:
   1. LATICRETE International, Inc; LATICRETE 254 Platinum: www.laticrete.com.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 GROUTS

A. Manufacturers:
   1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
   2. Bonsal American, Inc: www.sakrete.com
   3. Custom Building Products: www.custombuildingproducts.com/#sle.
   4. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Standard Grout: Polymer modified cement grout, sanded, as specified in ANSI A118.7.

2.06 MAINTENANCE MATERIALS

A. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
   1. Composition: Water-based colorless silicone.

2.07 THIN-SET ACCESSORY MATERIALS

A. Waterproofing Membrane at Floors and Walls: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
   1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
   2. Fluid or Trowel Applied Type:
      a. Material: Synthetic rubber or Acrylic.
      b. Products:
         1) Custom Building Products; RedGard Crack Prevention and Waterproofing Membrane: www.custombuildingproducts.com/#sle.
         2) Substitutions: See Section 01 60 00 - Product Requirements.

B. Floor Patch/Leveler
   1. Acceptable Product: Bostik, Floor Patch 101.

C. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 7/16 inch thick; 2 inch wide coated glass fiber tape for joints and corners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances. Current sloped floor shall be filled to provide flat, level substrate for tile installation. New floor installation will not slope to drain.

D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

E. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.

3.03 INSTALLATION - GENERAL

A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and The Tile Council of North America Handbook recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install non-ceramic trim in accordance with manufacturer's instructions.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

J. Grout tile joints. Use standard grout unless otherwise indicated.

K. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Install crack isolation / waterproofing membrane over prepared substrate in accordance with manufacturer's instructions. Extend membrane up wall behind tile base. Install sound fill at joint between floor and wall tile backer board and reinforce joint with manufacturer's reinforcing fabric.

1. Flood floor after membrane has fully cured. Submit report of flood test indicating any/all required repairs and final passing status.

B. Over concrete substrates, install in tile accordance with TCA Handbook Method F122, dry-set or latex-portland cement bond coat, over crack isolation / waterproofing membrane with standard grout, unless otherwise indicated.

3.05 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with The Tile Council of North America Handbook Method W244, using membrane at toilet rooms.

3.06 CLEANING

A. Clean tile and grout surfaces.

B. Seal grout joints.

3.07 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days or manufacturer's recommended curing time after installation.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

C. Support hangers, channels, and wires.

1.02 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2013a.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

C. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.

1.03 SUBMITTALS

A. See Setion 01 30 00 - Administrative Requirements.

B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.

C. Product Data: Provide data on suspension system components.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.04 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.

C. Installer Qualifications: Company specializing in installation of the products specified in this section with minimum five years documented experience.

1.05 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.06 PROJECT CONDITIONS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Install acoustical units after interior wet work is dry.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
   2. Certainteed Architectural: www.certainteed.com/ceilings-and-walls/#sle.
   3. Rockfon: www.rockfon.com/#sle.
   4. USG Corporation: www.usg.com/ceilings/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Suspension Systems:
   1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Panels, Type ACT-1: Painted mineral fiber, with the following characteristics:
   1. Classification: ASTM E1264 Type III.
      a. Form: 2, water felted.
      b. Pattern: "C" - perforated, small holes.
   2. Size: 24 by 24 inches.
   3. Thickness: 3/4 inch.
   4. Light Reflectance: 85 percent, determined in accordance with ASTM E1264.
   5. NRC: 0.70, determined in accordance with ASTM E1264.
   6. Ceiling Attenuation Class (CAC): 40, determined in accordance with ASTM E1264.
   7. Tile Edge: Square.
   8. Color: White.
   9. Suspension System: Exposed grid.
   10. Basis-of-Design Product:
      a. Armstrong World Industries, Inc; School Zone Fine Fissured: www.armstrongceilings.com/#sle.

C. Acoustical Panels, Type ACT-2: Mineral fiber with scrubbable finish, with the following characteristics:
   1. Classification: ASTM E1264 Type IX.
      a. Form: 2, water felted.
      b. Pattern: "G" - smooth.
   2. Size: 24 by 24 inches.
   3. Thickness: 5/8 inch.
   4. Light Reflectance: 81 percent, determined in accordance with ASTM E1264.
   5. NRC: N/A.
   6. Ceiling Attenuation Class (CAC): 33, determined in accordance with ASTM E1264.
   7. Panel Edge: Square.
   8. Color: White.
   9. Suspension System: Exposed grid.
   10. Basis-of-Design Product:
      a. Armstrong World Industries, Inc; Kitchen Zone: www.armstrongceilings.com/#sle..

D. Acoustical Panels, Type ACT-3: Ceramic-bonded mineral fiber, with the following characteristics:
   1. Classification: ASTM E1264 Type XX.
      a. Pattern: "E" - lightly textured.
   2. Size: 24 by 24 inches.
   3. Thickness: 5/8 inch
   4. Light Reflectance: 86 percent, determined in accordance with ASTM E1264.
   5. NRC: N/A.
   6. Ceiling Attenuation Class (CAC): 40, determined in accordance with ASTM E1264.
   7. Panel Edge: Square.
   8. Color: White.
   9. Suspension System: Exposed grid.
   10. Products:
      a. Armstrong World Industries, Inc; Ceramaguard, Unperforated www.armstrongceilings.com/#sle.

2.03 SUSPENSION SYSTEM(S) UNLESS NOTED OTHERWISE ABOVE.

A. Manufacturers:
   1. Same as for acoustical units.

2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.

C. Exposed Suspension System, Type 1: Hot-dip galvanized steel grid with steel cap.
1. Schedule: For use with ACT-1.
2. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
3. Profile: Tee; 15/16 inch face width.
4. Finish: Baked enamel.
5. Color: White.
6. Basis-of-Design Product:
a. Armstrong World Industries, Inc; Prelude XL: www.armstrongceilings.com/#sle.

D. Exposed Suspension System, Type 2: Type 304 stainless steel grid with polished stainless steel cap.
1. Schedule: For use with ACT-2 and ACT-3.
2. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
3. Profile: Tee; 15/16 inch face width.
4. Finish: Baked enamel.
5. Color: White.
6. Basis-of-Design Product:
a. Armstrong World Industries, Inc; Prelude Plus XL Stainless Steel: www.armstrongceilings.com/#sle.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.
1. Stainless Steel at ACT-2 and ACT-3.

B. Hanger Wire: 12-gage 0.08 inch galvanized steel wire.
1. Stainless Steell at ACT-2 and ACT-3.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Perimeter Moldings: Same material and finish as grid.
1. Size: As required for installation conditions.
2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
3. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.

E. Metal Edge Trim for Suspension Systems: Steel or extruded aluminum; provide attachment clips, splice plates, and preformed corner pieces for complete trim system.
1. Trim Height: 4 inch.
2. Finish: Baked enamel.
3. Color: White.

F. Gasket For Perimeter Moldings: Closed cell rubber sponge tape.

G. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C 636, ASTM E 580, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:240.

C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Install in bed of acoustical sealant or in bed of acoustical sealant.
   2. Use longest practical lengths.
   3. Miter or Overlap and rivet corners.

K. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install units after above-ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.
   3. Double cut and field paint exposed reveal edges.

G. Where round obstructions and bullnose corners occur, provide preformed closures to match perimeter molding.

H. Install hold-down clips on panels within 20 ft of an exterior door.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean surfaces.

C. Replace damaged or abraded components.

END OF SECTION

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SECTION 09 54 23
LINEAR METAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Linear metal ceilings.

B. Suspended metal support system and perimeter trim.

C. Supplementary insulation above ceiling.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021.

B. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2009a.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2014.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate work of this section with installation of mechanical and electrical components and with other construction activities affected by work of this section.

B. Preinstallation Meeting: Convene one week before starting work of this section.

C. Sequencing: Supply hanger clips during steel deck erection. Supply additional hangers and inserts as required.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Furnish for component profiles.

C. Shop Drawings: Indicate reflected ceiling plan.
   1. Seismic Design: Include seal and signature of design professional on each drawing.

D. Designer's qualification statement.

E. Manufacturer's qualification statement.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements for additional provisions.
   2. Acoustical Metal Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
   3. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Accept factory-finished products on site in manufacturer's unopened factory packaging only; reject opened packages.

C. Protect factory-finished products from damage to appearance by storing products in manufacturer's unopened factory packaging in dry storage area.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty; include coverage for corrosion resistance and discoloration of surface finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design: Armstrong World Industries, Inc., Serpentina Waves.

B. Available Manufacturers: Subject to requirements of drawings and specifications, products fromthe following manufacturers may be provided.
   1. Armstrong World Industries, Inc; Serpentina Waves: www.armstrongceilings.com/#sle.
   2. ATAS International, Inc; Lineair Opaline: www.atas.com/#sle.
   3. Rockfon; CurvGrid One-directional Curved Ceiling System: www.rockfon.com/#sle.
   4. USG Corporation; Curvatura 3-Dimensional Suspension System: www.usg.com/ceilings/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LINEAR METAL CEILINGS

A. Linear Metal Ceiling System: Panels, suspension members, trim, and accessories as required to provide a complete system.

B. Performance Requirements:
   1. Flame Spread: ASTM E 1264; Class A.
   2. Design to support imposed loads of indicated items without eccentric loading of supports.
   3. Design for maximum deflection of 1/360 of span.
   4. Noise Reduction Coefficient (NRC): 0.96, measured in accordance with ASTM C423 with insulation installed.

2.03 COMPONENTS

A. Linear Metal Panels:
   1. Type: Linear panel, butt jointed; snap-in installation.
      a. Surface Texture: Smooth
      b. Size and Configuration: As indicated on drawings.
      c. Panel Profile: Square 15/16".
      d. Perforations: 3/16" Dia. at 1" O.C..
   2. Material: Aluminum sheet, ASTM B209/B209M.
      a. Finish: Enamel; Select color from manufacturer's standard range.

B. Acoustical Backer: Manufacturer's standard plastic-wrapped fiberglass; as required to achieve specified acoustic performance.

C. Edge Molding and Splices: Same material, thickness, and finish as linear panels.

D. Accessories: Stabilizer bars and clips as required for suspended grid system; sight-exposed surfaces same color and finish as sight-exposed surfaces of linear panels.

E. Suspension Members: Formed aluminum sections, with integral attachment points; primed finish; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

F. Suspension Wire: Size and type as required for application and ceiling system flatness requirement specified.

2.04 FABRICATION

A. Shop cut linear panels to accommodate mechanical and electrical items.

B. Factory-form internal and external corners of same material, thickness, finish, and profile to match exposed linear panels; back brace internal corners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

C. Verify that required utilities are available, in proper location, and ready for use.

D. Verify that field measurements are as indicated.

E. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.02 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
   1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.03 INSTALLATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

B. Suspension Components:
   1. Install after above-ceiling work is complete in accordance with manufacturer's instructions, ASTM C636/C636M, and ASTM E580/E580M.
   2. Hang carrying members independent of walls, columns, ducts, light fixtures, pipe, and conduit; where carrying members are spliced, avoid visible displacement of face panels with adjacent panels.
   3. Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest adjacent hangers to span the required distance.

C. Linear Metal Ceiling:
   1. Install linear panels and other system components in accordance with manufacturer's instructions.
   2. Align end joints.
   3. Butt interior end joints tight.
   4. Set exterior end joints with 1/16 inch gap for expansion and contraction.
   5. Provide expansion joints to accommodate plus or minus 1 inch movement and maintain visual closure.
   6. Field miter corners at changes in panel direction.
   7. Install filler strips between linear panels at interior locations.
   8. Install edge moldings at junctions with other finishes and at vertical surfaces; use maximum piece lengths.
   9. Install end caps at sight-exposed ends of linear panels.
   10. Exercise care when site cutting sight-exposed finished components to ensure surface finish is not defaced.

D. Insulation: Install above panel members; fit tight between grid members; place insulation with facing side down.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

C. Maximum Variation From Dimensioned Position: 1/4 inch.

3.05 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean surfaces.

C. Replace damaged or abraded components.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

C. Section 09 05 61 - Common Work Results for Flooring Preparation.

D. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures. Floor preparation.

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

C. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2014).

D. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012).

E. CAL (CHPS LEM) - Low-Emitting Materials Product List; California Collaborative for High Performance Schools (CHPS); current edition at www.chps.net/.

F. GEI (SCH) - GREENGUARD "Children and Schools" Certified Products; GREENGUARD Environmental Institute; current listings at www.greenguard.org.

G. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; Resilient Floor Covering Institute; October 2011.

H. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

I. SCS (CPD) - SCS Certified Products; Scientific Certification Systems; current listings at www.scscertified.com.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Verification Samples: Submit two samples, 6x6 inch in size illustrating color and pattern for each resilient flooring product specified.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum ten years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum five years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Do not double stack pallets.

1.07 FIELD CONDITIONS

A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.08 EXTRA MATERIALS

A. See Section 01 60 00 - Product Requirements, for additional provisions.

B. Provide Provide 50 sq ft of flooring of each type and color specified.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Quartz-Vinyl Composition Tile: Homogeneous combination of high quality vinyl, calcium carbonate, and fine and naturally weathered quartz:
   1. Minimum Requirements: Comply with ASTM F 1066, of Class 1, Type A.
   2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648.
   3. Size: 24 x 24 inch.
   4. Thickness: 0.08 inch.
   5. Static Load: 3,000 psi, ASTM F970.
   6. Content: Minimum 70% quartz, 15% vinyl.
   7. Pattern: Solid color and marbelized.
   8. Color: (5) Five colors to be selected by Architect from manufacturer's full range.
      a. QT1: Ricket Quartz Tile, 8801, Medly, Frost Mix.
      b. QT2: Ricket Quartz Tile, 8832, Medly, Cerulean.
      c. QT3: Ricket Quartz Tile, 8841, Medly, Guacamole.
      d. QT4: Ricket Quartz Tile, 8803, Medly, Silver Cloud.
      e. QT5: Ricket Quartz Tile, 8804, Medly, Tribeca.
      f. QT6: Ricket Quartz Tile, 8834, Medly, Persian Indigo.
   9. Manufacturers:
      a. Basis-of-Design: Rickett Quartz Tile by Rickett.
      b. Subject to compliance with drawings and specifications, products from the following manufacturers may be provided.
         1) Altro Floors; Quartz Tile: www.altro.com
         2) Johnsonite, a Tarkett Company: www.johnsonite.com.
         3) Kahrs Upofloor; Quartz: www.karhrs.com.
         4) Procedo Flooring; Versa Quartz: www.procedoflooring.com.
         5) Substitutions: See Section 01 60 00 - Product Requirements.

2.02 RESILIENT BASE

A. Resilient Base: ASTM F 1861, Type TS rubber, vulcanized thermoset; top set cover and as follows:
   1. Manufacturers:
      a. Burke Flooring; Commercial Wall Base - TS: www.burkeflooring.com/#sle.

b. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
c. Mannington Commercial: www.manningtoncommercial.com#sle.
d. Roppe Corp: www.roppe.com/#sle.
e. Substitutions: See Section 01 60 00 - Product Requirements.

2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
3. Height: 4 inch. Match existing.
4. Thickness: 0.125 inch thick.
5. Finish: Matte.
6. Length: Roll.
7. Color: (3) Three colors to be selected by Architect from manufacturer's full range.
8. Accessories: Premolded external corners and end stops.
9. Manufacturers:
   a. Burke Flooring: www.burkemercer.com.
   b. Johnsonite, a Tarkett Company: www.johnsonite.com.
   c. Roppe Corp: www.roppe.com.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.
   1. Provide only products having lower volatile organic compound (VOC) content than required by the more stringent of the South Coast Air Quality Management District Rule No.1168 and the Bay Area Air Quality Management District Regulation 8, Rule 51.

C. Moldings and Edge Strips: Rubber.
   1. Products: manufactured by Roppe.

D. Floor sealer and wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive resilient flooring.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

3.02 PREPARATION

A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings.

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

D. Prohibit traffic until filler is cured.

E. Clean substrate.

F. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's instructions.

C. Install feature strips where indicated.

D. Spread only enough adhesive to permit installation of materials before initial set.

E. Fit joints tightly.

F. Set flooring in place, press with heavy roller to attain full adhesion.

G. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

H. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

I. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 TILE FLOORING

A. Install in accordance with manufacturer's instructions.

B. Mix tile from container to ensure shade variations are consistent when tile is placed, unless manufacturer's instructions say otherwise.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Set flooring in place, press with heavy roller to attain full adhesion.

E. Lay flooring with joints and seams parallel or as shown on plans to building lines to produce symmetrical tile pattern.

F. Install tile to basket weave pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

G. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.

H. Scribe flooring to walls, columns, cabinets, and other appurtenances to produce tight joints.

I. Install flooring in recessed floor access covers. Maintain floor pattern.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 48 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

A. Remove adhesive residue with clean white cloth dampened with mineral spirits. Do not use harsh solvents. Follow with water rinse.

B. Wait 72 hours (3 days) before wet-washing the new floor. This will allow the adhesive to cure.

C. Clean in accordance with manufacturer's instructions.

D. Clean, seal, and wax resilient flooring products in accordance with manufacturer's instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

B. Wait 72 hours (3 days) before wet-washing the new floor. This will allow the adhesive to cure.

END OF SECTION

SECTION 09 65 66
RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 RELATED REQUIREMENTS

A. Section 09 05 61 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

B. Section 09 65 00 - Resilient Flooring.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Selection Samples: Manufacturer's color charts for flooring materials specified and game line paints, indicating full range of colors and textures available.

D. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

E. Sustainable Design Submittal: Submit VOC content documentation for flooring and adhesives.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

C. Store flooring and installation materials in protected dry spaces, with ambient temperatures maintained within range recommended by manufacturer, but not less than 55° F (13° C) nor more than 85° F (29° C).

D. Store the indoor resilient athletic surfacing rolls in an upright position on a smooth flat surface immediately upon delivery to Project.

1.07 FIELD CONDITIONS

A. Product Installation:
   1. Maintain temperatures during installation within range recommended by manufacturer, but not less than 65° F (18° C) in spaces to receive flooring 48 prior, during and 48 hours after installation.
   2. After installation, maintain temperatures within range recommended by manufacturer, but not less than 55° F (13° C) or more than 85° F (29° C).
   3. Prohibit traffic during flooring installation and for at least 48 hours after flooring installation.

1.08 WARRANTY

A. Special Limited Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace sports flooring that fails within specified warranty period.
   1. Material warranty must be direct from the product manufacturer.
      a. Material warranties from private label distributors are not valid.

2. Failures include, but are not limited to, the following:
    a. Material manufacturing defects.
    b. Failure due to substrate moisture exposure not exceeding 98% relative humidity (RH) when tested according to ASTM F2170
3. Warranty Period: 15 years from date of Substantial Completion.

B. Special Limited Warranty: Installer's standard form in which installer agrees to repair or replace sports flooring that fails due to poor workmanship or faulty installation within the specified warranty period.
1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL

A. All products and accessories shall be by flooring manufacture, or approved by flooring manufacture.

2.02 PREFORMED ATHLETIC FLOORING

A. Basis-of-Design: Gerflor - Taraflex, Multi-Use 6.2 with Gerflor - Gameline Paint System.

B. Manufacturers: Suject to requirements of drawings and specification, products from the following manufacturers may be provided.
1. Gerflor; Taraflex www.gerflorusa.com/#sle.
2. Grid: www.builtbygrid.com/#sle.
3. Mondo America, Inc: www.mondoworldwide.com/#sle.
4. Tarkett Sports: www.tarkettsportsindoor.com.
5. Harlequin Floors: www.us.harlequinfloors.com
6. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 SHEET VINYL RESILIENT ATHLETIC FLOORING:

A. Basis-of-Design: Gerflor - Taraflex, Multi-Use 6.2 with Gerflor - Gameline Paint System.

B. Product Description: Foam-backed sheet vinyl flooring designed for fully adhered athletic flooring applications.
1. Overall Thickness: Not less than 0.24 inch (6.2 mm)
2. Wear-Layer Thickness: Not less than 0.08 inch (2.1 mm)
3. Foam Backing:
    a. Very high density, two layer, dual-durometer, closed cell foam
    b. Two (2) layers of fiberglass reinforcement for dimensional stability and indentation resistance. One layer of woven grid fiberglass and an additional layer of non-woven fiberglass.
    c. Basis-of-Design Product: Taraflex Multi-Use 6.2
4. Seaming Method: Heat welded.
5. Adhesive Method:
    a. Full-spread adhesive coverage to completely adhere flooring to substrate.
    b. Complete adhesive coverage to eliminate the possibility of gaps or space between the slab and flooring material where moisture could accumulate and create an environment conducive to mold growth.
    c. Flooring to be fully adhered to the concrete slab in all locations eliminating the possibility of waves or wrinkles forming caused by the floor shifting, moving or by rolling loads displacing it.
6. Traffic-Surface Texture: Wood visual shall have wood grain embossed texture for a genuine wood appearance and Solid colors to have “pebbled” embossed texture for an attractive appearance.
7. Bacteriostatic and Fungicidal Treatment: Manufacturer’s factory-applied permanent treatment throughout the flooring material which can improve indoor air quality and reduce asthma and allergy risks associated with bacterial and mold growth.
    a. Basis-of-Design Product: Taraflex Multi-Use 6.2
8. Applied Finish: Manufacturer's, factory-applied, permanent and UV-cured.

a. No-Wax finish: Published product literature identifying factory applied finish as, “No-Wax-Just clean and rinse”
b. Basis-of-Design Product: Gerflor Protecsol

9. Field-Applied Finishes: None required and not allowed.
10. Roll Size:
    a. Roll Width: Rolls to be a minimum width of 59 inches (1.5 m) wide.
11. Roll Length: Wood visual rolls to be a minimum length of 67 feet, 3 inches (20.5 m).
    a. Color and Pattern:
        1) 6350 Light Cherry.
        2) Wood pattern shall accurately simulate the true visual appearance of natural athletic wood strip flooring.
            (a) Pattern shall replicate random-length stock by simulating non-uniform board lengths ranging from 18 inches to 48 inches with a maximum board width of 2-1/2 inches.
            (b) Wood pattern shall not include a dark line simulating edges or ends of individual boards.
            (c) Surface texture shall simulate realistic wood grain and not be raised or "pebbled" embossing.

C. Performance Criteria:
1. ASTM F2772-11 Indoor Sport Floor Standard:
    a. Provide certification of compliance for the four ASTM F2772 Indoor Sport Floor Standard performance categories:
        1) Shock Absorption/Force Reduction:
            (a) Class C2 (22% to 33%). Pass
        2) Ball Bounce:
            (a) Minimum 90%: Pass
        3) Surface effect/Coefficient of Friction:
            (a) Between 80-110: Pass
        4) Vertical deformation:
            (a) Maximum 3.5mm: Pass
2. Resistance to Rolling Load: EN 1569; Pass.
3. Chemical Resistance: ASTM D 543; OK.
4. Impact Resistance: EN 1517; Pass.
5. Abrasion Resistance: EN ISO 5470; Pass.
6. Sound Insulation: EN ISO 717; 18 dB.
7. Gloss/Brightness: EN ISO 2813; Pass.
8. Organic Emission: ASTM D 5116; Pass
9. Fire Performance: ASTM E 648; Greater than 0.45 W/cm2, Class 1.
10. Surface Maintenance Requirements: No-wax surface requiring only cleaning and rinsing.
11. Slab Moisture Design Tolerance: Maximum relative humidity (RH) of 98% when tested according to ASTM F 2170.

2.04 ACCESSORIES

A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.

B. Flooring Adhesive: Waterproof; types recommended by flooring manufacturer.

C. Heat Welding Rod: As supplied by indoor resilient athletic flooring manufacturer. Color shall blend with resilient athletic flooring color.

D. Game-Line and Marker Paint: Complete system as supplied by indoor resilient athletic flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of athletic flooring to substrate.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure proper adhesion of resilient athletic flooring system.

B. Concrete Substrates: Prepare according to ASTM F710.
   1. Verify that substrates are dry and free of sealers, curing compounds and other additives. Remove coatings and other substances that are incompatible with adhesives using mechanical methods recommended by manufacturer.
   2. Alkalinity Testing: Perform pH testing according to ASTM F710. Proceed with installation only if pH readings are between 7.0 and 8.5.

C. Moisture Testing: Perform ASTM F2170 relative humidity test and proceed with installation only after substrates have maximum relative humidity (RH) of 98%

D. Use a trowelable concrete based patching compound with the same moisture vapor tolerance as the adhesive to fill depressions, holes, cracks, grooves or other irregularities in substrate.

E. Place flooring and installation materials into spaces where they will be installed at least 48 hours before installation. Install flooring materials only after they have reached the same temperature as space where they are to be installed.

F. Sand the surface of the concrete slab.

G. Sweep and then vacuum substrates immediately before installation. After cleaning, examine substrate for moisture, alkaline salts, grit, dust or other contamination. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. General:
   1. Comply with resilient athletic flooring manufacturer's installation instructions.
   2. Take necessary precautions to minimize noise, odors, dust and inconvenience during installation.
   3. Fit flooring neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.
   4. Extend flooring into toe spaces, door reveals, closets, and similar openings unless otherwise indicated.

C. Lay out flooring as follows:
   1. Minimize number of seams and place them inconspicuous areas.
   2. Locate seams as shown on approved Shop Drawings

D. Adhered Flooring: Attach products to substrates using a full-spread of adhesive applied to substrate to comply with adhesive and flooring manufacturer instructions.

E. Vinyl Sheet Flooring Seams: Finish seams to produce surfaces flush with adjoining flooring surfaces. Comply with ASTM F 1516. Rout joints and use heat welding rod to permanently and seamlessly fuse sections together.

3.04 GAME LINES AND LOGOS

A. Mask flooring at game lines and logos, and apply paint of color indicated to produce clean, sharp and distinct edges.

B. Colors: Five colors.

3.05 CLEANING

A. Clean flooring using methods recommended by manufacturer.

3.06 PROTECTION

A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

END OF SECTION

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SECTION 09 67 00
FLUID-APPLIED FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fluid-applied flooring and base.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between fluid-applied flooring and adjacent construction and fixtures.

B. Section 09 05 61 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.

C. Samples: Submit two samples, 4 by 4 inch in size illustrating color and pattern for each floor material for each color specified.

D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and application rate for each coat.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Top Coat Materials: 2 gallons.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.

B. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.07 FIELD CONDITIONS

A. Maintain minimum temperature in storage area of 55 degrees F.

B. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.01 FLUID-APPLIED FLOORING SYSTEMS

A. Fluid-Applied Flooring: Epoxy base coat(s), with broadcast aggregate.
   1. Basis-of-Design: Sherwin Williams, Resuflor Deco Quartz BC 23.
   2. Aggregate: Quartz granules.
   3. Top Coat: Polyurethane.
   4. System Thickness: 1/8 inch, nominal, dry film thickness (DFT).
   5. Texture: Slip resistant.
   6. Sheen: Matte.

7. Color: Meteor Shower.
8. Products: Subject to compliance with drawings and specifications, products from the following manufacturers may be provided.
   a. Seal Krete; Epoxy=Shell Souble Broadcast Quartz System: www.hp.seal-Krete.com,
   b. Sherwin-Williams High-Performance Flooring; Resuflor Deco Quartz BC 23: www.sherwin-williams.com/resin-flooring/#sle.
   c. Sika Corporation; Sikafloor Quartzite Broadcast System: www.sikafloorusa.com/#sle.
   d. Stonhard; Stonshield SLT: www.stonhard.com/#sle.
   e. TNEMEC; 1/8" Deco-Tread Quartz System: www.tnemec.com/#sle.
   f. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

A. Base Caps: Extruded anodized aluminum with project base of 1/8 inch.

B. Cant Strips: Molded of flooring resin material.

C. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.

D. Primer: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for fluid-applied flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by fluid-applied flooring manufacturer.

3.02 PREPARATION

A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.

C. Vacuum clean substrate.

D. Apply primer to surfaces required by flooring manufacturer.

3.03 INSTALLATION - ACCESSORIES

A. Install cant strips at base of walls where flooring is to be extended up wall as base.

B. Install terminating cap strip at top of base; attach securely to wall substrate.

3.04 INSTALLATION - FLOORING

A. Apply in accordance with manufacturer's instructions.

B. Apply each coat to minimum thickness required by manufacturer.

C. Finish to smooth level surface.

D. Install flooring in recessed type floor access covers.

3.05 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Barricade area to protect flooring until fully cured.

END OF SECTION

SECTION 09 68 00
CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Modular Carpet

1.02 RELATED REQUIREMENTS

A. Section 09 05 61 - Common Work Results for Flooring Preparation.

1.03 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

D. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2009.

E. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug Institute; Current Edition.

F. CRI (GLC) - Green Label Testing Program - Approved Product Categories for Carpet; Carpet and Rug Institute; Current Edition.

G. CRI (GLCC) - Green Label Testing Program - Approved Product Categories for Carpet Cushion; Carpet and Rug Institute; Current Edition.

H. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.

I. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements.

B. Qualifications: Submit manufacturer's qualifications.

C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

D. Samples: Submit two samples 24 x 24 inch in size illustrating color and pattern for each carpet and cushion material specified.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional requirements.
   2. Extra Carpet: 150 sq ft of each type, color, and pattern installed.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum ten years experience.

B. Installer Qualifications: Company specializing in installing carpet with minimum five years experience.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.

C. Ventilate installation area during installation and for 72 hours after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carpet: Subject to requirements of drawings and specifications, products from the folllowing manufacturers may be provided.
   1. Interface, Inc., Open Ended, 103178 Indigo.
   2. Mannington Commercial: www.manningtoncommercial.com#sle.
   3. Mohawk Group: www.mohawkgroup.com/#sle.
   4. Tarket: www.commercial.tarkett.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 CARPET

A. Carpet Tile CT-1: Office Carpet.
   1. Product: Open Ended, 103178 Indigo manufactured by Interface, Inc.
   2. Product Size: 9.845 inch x 39.38 inch tile.
   3. Installation Method: Ashlar.
   4. Primary Backing: Non-woven synthetic fiber.
   5. Face Weight: 22 oz/sq yd.
   6. Gauge: 1/12 inch.
   7. Stitches Per Inch: 9.0 stitches / inch.
   8. Pile Density: 7,615 ox/ cu yd.
   9. Pile Height Average: 0.17 inch.
   10. Fiber System: 100% recycled nylon.
   11. Dye Method: 100% solution dyed.
   12. Soil/Stain Protection: Protekt 2.
   13. Colorfastness to Light: > 4 after 60 hours (AATCC 16E).
   14. Surface Flammability: Passes DOC-FF-1-70, Methenamine Pill Test.
   15. Flooring Radiant Panel: Class 1 (mean average CRF: 0.45 w/sq cm or higher) (ASTM E-648).
   16. Smoke Generation: Less than 450 (ASTM E-662)

B. Carpet Tile CT-2: Walk-Off Mat.
   1. Product: Assertive Action manufactured by Tarkett.
   2. Size: 24 inch by 24 inch.
   3. Installation Method: Ashlar.
   4. Tile thickness: 0,34 inch.
   5. Primary Backing: Powerbond Cushion, non-woven synthetic fiber.
   6. Face Weight: 29 oz/sq yd.
   7. Gauge: 1/10 inch.
   8. Stitches Per Inch: 9.0 stitches / inch.
   9. Pile Density: 10,989 oz/ cu yd.
   10. Pile Thickness: 0.095 inch.
   11. Pile Height: 0.187 inch.
   12. Fiber System: TDX nylon.
   13. Dye Method: 100% solution dyed.
   14. Surface Flammability: Passes DOC-FF-1-70, Methenamine Pill Test.
   15. Flooring Radiant Panel: Class 1 (mean average CRF: 0.45 w/sq cm or higher) (ASTM E-648).
   16. Smoke Generation: Less than 450 (ASTM E-662)

2.03 ACCESSORIES

A. Sub-Floor Filler: Type recommended by carpet manufacturer.

B. Moldings and Edge Strips: Rubber, color as selected.

C. Carpet Adhesive: Recommended by carpet manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive carpet.

B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesives to sub floor surfaces.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Lay out carpet tiles:
   1. Horizontal ashlar pattern. If no pattern indicated consult Architect for pattern and orientation of tiles.
      a. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
      b. Do not locate seams perpendicular through door openings.
      c. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
      d. Locate change of color or pattern between rooms under door centerline.
      e. Provide monolithic color, pattern, and texture match within any one area.

C. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance.

3.04 DIRECT-GLUED CARPET

A. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to cut edges of woven carpet immediately.

B. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.

C. Apply seam adhesive to the base of the edge glued down. Lay adjoining piece with seam straight, not overlapped or peaked, and free of gaps.

D. Roll with appropriate roller for complete contact of adhesive to carpet backing.

E. Trim carpet neatly at walls and around interruptions.

F. Complete installation of edge strips, concealing exposed edges. Bind cut edges where not concealed by edge strips.

3.05 CLEANING

A. Remove excess adhesive from floor and wall surfaces without damage.

B. Clean and vacuum carpet surfaces.

END OF SECTION

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SECTION 09 84 30
SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sound-absorbing wood grille wall panels.

1.02 RELATED REQUIREMENTS

A. Section 06 20 00 - Finish Carpentry: Wood trim work.

1.03 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2009a.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

D. ASTM E795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests; 2005 (Reapproved 2012).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, panel layout.

D. Selection Samples: Manufacturer's color charts for wood veneer, indicating full range of available colors and finishes.

E. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and fabric covering.

F. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Panels: Quantity equal to 5 percent of total installed, but not less than two full panels of each type.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with at least ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.

B. Store units flat, in dry, well-ventilated space; do not stand on end.

C. Protect edges from damage.

D. Material must be stored and installed only in a secured ambient environment (humidity minimum 25%, maximum 55%, temperature range 60°F to 80°F).

E. Windows, doors, HVAC and all wet work must be completed before unpacking and installation. Handle carefully to avoid damaging materials.

F. Store materials in original, unopened packages in a fully-enclosed space protected against damage from moisture, direct sunlight, surface contamination, pest infestations, and other damage hazards.

G. Prior to installation, acclimatize wood components for a minimum of 72 hours to stabilize moisture content and reach room temperature, per AWI standards.

H. Handle Acoustic Plank Wood Members carefully to avoid chipping edges or damaging units in any way.

1.07 COORDINATION

A. Coordinate the installation of the acoustic wood grille wall panel system with any and all trades whose work is impacted by that installation

1.08 MOCK-UPS

A. See Section 01 40 00 - Quality Requirements for additional mock-up requirements.

B. Construct mock-up of acoustical units at location as indicated by Architect.
   1. Minimum mock-up dimensions; 48 by 96 inches.

1.09 ATTIC STOCK

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
   1. Wood Components: Furnish full-size components equal to 2.0 percent of amount installed.

PART 2 PRODUCTS

2.01 WOOD SLAT SOUND-ABSORBING PANELS

A. Manufacturers:
   1. Basis-of-Design: Certainteed Architectural, Veneered Wood Grille Wall Modules, 4840B2, 12" x 96" x 2-3/8" panel, eight 3/4" x 2-1/4" blades, 3/4" spacing between blades, 1" theatre black & felt backing.
   2. Available Manufacturers: Subject to requirements of drawings and specifications, products from the following manufacturers may be provided.
      a. Certainteed Architectural, Veneered Wood Grille Wall Modules.
      b. RealAcoustix, LLC, RealGrille, slat dimensions and spacing to match basis-of-design.
      c. USG, True Wood Modular Grille 12" x 96" x 1-7/8", 8 slats per panel.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

B. General:
   1. Composite panel consisting of wood veneered slats bonded to a recycled acoustic felt backing.

C. Solid Wood Grille Wall Modules:
   1. Species: Plain Slice White Oak, VPO0.
   2. Finish: Clear Finish, O.
   3. Substrate: Veneered Composite.
   4. Surface Burning Characteristics: Class A per ASTM E84, CAN/ULC-S102.
      a. Flame Spread: 25 or less (Composite Wood).
      b. Smoke Developed: 50 or less (Composite Wood).
   5. Configuration: Plywood Backer Grille.
   6. Blade Width: 3/4 inch.
   7. Blade Depth: 2-1/4 inch.
   8. Blades per Foot Width: 8.
   9. Reveal: Felt.
   10. Noise Reduction Coefficient (NRC) per ASTM C423: 0.85.
   11. Backing: CertainTeed 1" Theatre Black and Felt.
   12. Mounting: Wall direct mount, slats set vertically.

2.02 FABRICATION

2.03 ACCESSORIES

A. Trim Moldings: Manufacturer's standard wood trim moldings for concealing panel joints; wood species and color to match panel.

B. Screws: Black pancake-head screws.

C. Panel Adhesive: Acceptable to acoustical panel manufacturer for application as indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Ensure HVAC system is operating, supply air and return air is filtered to remove particulates, the building is at the appropriate temperature and humidity, and the space is free from interior construction dust.

3.02 INSTALLATION

A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.

B. Install mounting accessories and supports in accordance with shop drawings.

C. Align panels accurately, with edges plumb and horizontal edges level. Scribe to fit accurately at adjoining work and penetrations.

D. Arrange adjacent panels so that slat spacing between panels matches slat spacing of the panel itself. Fit edges of felt backing neatly together.

E. Install acoustical panels with mechanical fasteners. Fastener pattern, number and spacing per manufacturers instructions.

F. Install acoustical units to construction tolerances of plus or minus 1/16 inch for the following:
   1. Plumb and level.
   2. Flatness.

3.03 CLEANING

A. Clean sound-absorptive panels upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.04 PROTECTION

A. Provide protection of installed acoustical panels until Date of Substantial Completion.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

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SECTION 09 90 00
PAINTS AND COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints and other coatings.

C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Elevator pit ladders.
   3. Exposed surfaces of steel lintels and ledge angles.
   4. Surfaces inside cabinets.
   5. Mechanical and Electrical:
      a. In finished areas, paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.

D. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne, and lead items.
   6. Floors, unless specifically so indicated.
   7. Glass.
   8. Acoustical materials, unless specifically so indicated.
   9. Concealed pipes, ducts, and conduits.

E. Painting materials and methods for conduit identification specified in Section 26 05 53.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2014.

C. NACE (IMP) - Industrial Maintenance Painting; NACE International; Edition date unknown.

D. SSPC (PM1) - Good Painting Practice: SSPC Painting Manual, Vol. 1; Society for Protective Coatings; Fourth Edition.

1.04 DEFINITIONS

A. Conform to ASTM D 16 for interpretation of terms used in this section.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements and Section 01 33 00 Submittal Procedures, for submittal procedures.

B. Qualifications: Submit Manufacturer's qualifications.

C. Product Data: Provide data on all finishing products and special coatings, including VOC content.

D. Samples: Submit two paper chip samples, 12 x 12 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.

E. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.

F. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Paint and Coatings: 1 gallon of each color; store where directed.
   3. Label each container with color, type, texture, and room locations in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum ten years experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke rating requirements for products and finishes.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.10 EXTRA MATERIALS

A. See Section 01 60 00 - Product Requirements, for additional provisions.

B. Supply 1 gallon of each color; store where directed.

C. Label each container with color, type, texture, and room locations in addition to the manufacturer's label.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. ICI Paints North America: www.icipaints.com

2. Duron, Inc: www.duron.com/#sle.
3. Sherwin Williams: www.sherwin-williams.com
4. Benjamin Moore & Co: www.benjaminmoore.com/#sle.

C. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
3. Supply each coating material in quantity required to complete entire project's work from a single production run.
4. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Chemical Content: The following compounds are prohibited:
1. Aromatic Compounds: In excess of 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
2. Acrolein, acrylonitrile, antimony, benzene, butyl benzyl phthalate, cadmium, di (2-ethylhexyl) phthalate, di-n-butyl phthalate, di-n-octyl phthalate, 1,2-dichlorobenzene, diethyl phthalate, dimethyl phthalate, ethylbenzene, formaldehyde, hexavalent chromium, isophorone, lead, mercury, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, naphthalene, toluene (methylbenzene), 1,1,1-trichloroethane, vinyl chloride.

D. Colors: To be selected from manufacturer's full range of available colors.
1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint CE-OP-3L - Masonry/Concrete, Opaque, Latex, 3 Coat:
1. One coat of block filler.
2. Satin: Two coats of latex enamel.

B. Paint ME-OP-3A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
1. One coat of alkyd primer.
2. Semi-gloss: Two coats of alkyd enamel.

2.04 PAINT SYSTEMS - INTERIOR

A. Paint WI-OP-3L - Wood, Opaque, Latex, 3 Coat:
1. One coat of latex primer sealer.
2. Semi-gloss: Two coats of latex enamel

B. Paint WI-TR-V - Wood, Transparent, Varnish, No Stain:
1. One coat sealer.
2. Satin: One coat of varnish.

C. Paint CI-OP-3L - Concrete/Masonry, Opaque, Latex, 3 Coat:
1. One coat of block filler.
2. Egg Shell: Two coats of latex enamel.

D. Paint MI-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:
1. Touch-up with latex primer or manufacturer recommended.
2. Flat: Two coats of latex enamel.

E. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:
1. One coat of alkyd or latex primer sealer.

2. Eggshell: Two coats of latex enamel.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Gypsum Wallboard: 12 percent.
2. Plaster and Stucco: 12 percent.
3. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
5. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to coating application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.

E. Marks: Seal with shellac or stain blocker those which may bleed through surface finishes.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

H. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.

I. Insulated Coverings to be Painted: Remove dirt, grease, and oil from canvas and cotton.

J. Aluminum Surfaces to be Painted: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

K. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

L. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-PC 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).

M. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid

solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.

N. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

O. Interior Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

P. Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

Q. Exterior and Interior Wood to Receive Opaque Latex Stain Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior caulking compound after initial coat has been applied. Back stain concealed surfaces before installation.

R. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

C. Apply products in accordance with manufacturer's instructions.

D. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

E. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

F. Apply each coat to uniform appearance.

G. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

H. Sand wood and metal surfaces lightly between coats to achieve required finish.

I. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

J. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

K. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to Section 22 05 53, Section 23 05 53 and Section 26 05 53 for schedule of color coding of equipment, duct work, piping, and conduit.

B. Paint shop-primed equipment, where indicated.

C. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

D. Finish equipment, piping, conduit, and exposed duct work in utility areas in colors according to the color coding scheme indicated.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.05 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.06 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.07 PROTECTION

A. Protect finished coatings until completion of project.

B. Touch-up damaged coatings after Substantial Completion.

3.08 SCHEDULE - SURFACES TO BE FINISHED

A. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically noted.
   2. Fire rating labels, equipment serial number and capacity labels.
   3. Stainless steel items.

B. Paint the surfaces described below under Schedule - Paint Systems.

C. Mechanical and Electrical: Use paint systems defined for the substrates to be finished.
   1. Where indicated as exposed, paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment occurring in finished areas to match background surfaces.
   2. Paint all equipment, including that which is factory-finished, exposed to weather or to view on the roof and outdoors.
   3. Paint shop-primed items occurring in finished areas.
   4. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
   5. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.

D. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

END OF SECTION

SECTION 10 11 00
VISUAL DISPLAY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Porcelain enamel steel markerboards.

B. Tackboards.

1.02 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2016.

B. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2018.

C. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2020.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data on porcelain enamel steel markerboard, tackboard, trim, and accessories.

C. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.

D. Samples: Color charts for selection of color and texture of porcelain enamel steel markerboard, tackboard, tackboard surface covering, and trim.

E. Manufacturer's printed installation instructions.

F. Maintenance Data: Include data on regular cleaning, stain removal.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 VISUAL DISPLAY UNITS

A. Porcelain Enamel Steel Markerboards:
   1. Manufacturers:
      a. AJW Architectural Products: www.ajw.com/#sle.
      b. ASI Visual Display Products: www.asi-visualdisplayproducts.com/#sle.
      c. Claridge Products and Equipment, Inc; ____: www.claridgeproducts.com/#sle.
      d. Nelson Adams NACO: www.nelsonadamsnaco.com/#sle.
   2. Color: As selected from manufacturer's full range.
   3. Steel Face Sheet Thickness: 24 gauge, 0.0239 inch .
   4. Core: Particleboard, manufacturer's standard thickness, laminated to face sheet.
   5. Backing: Aluminum foil, laminated to core.
   6. Size: As indicated on drawings.
   7. Frame: Extruded aluminum, with concealed fasteners.
   8. Frame Finish: Anodized, natural.
   9. Accessories: Provide marker tray and map rail.

B. Tackboards: Fabric laminated to cork.
   1. Manufacturers:
      a. AJW Architectural Products: www.ajw.com/#sle.
      b. ASI Visual Display Products: www.asi-visualdisplayproducts.com/#sle.

c. Nelson Adams NACO: www.nelsonadamsnaco.com/#sle.

2. Cork Thickness: 1/4 inch.
3. Fabric: Vinyl-coated fabric or burlap.
4. Color: As selected from manufacturer's full range.
5. Backing: Hardboard, 1/4 inch thick, laminated to tack surface.
6. Size: As indicated on drawings.
7. Frame: Same type and finish as for markerboard.
8. Accessories: Provide map rail.

2.02 MATERIALS

A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.

B. Vinyl-Coated Fabric: ASTM F793/F793M Category VI.

C. Burlap: Tightly woven, flame retardant treated.

D. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.

E. Foil Backing: Aluminum foil sheet, 0.005 inch thick.

2.03 ACCESSORIES

A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall, full width of frame.

B. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.

C. Marker Tray: Aluminum, manufacturer's standard profile, one piece full length of markerboard, molded ends, concealed fasteners, same finish as frame.

D. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.02 PREPARATION

A. Acclimatize tackable wall panels by removing from packaging in installation area not less than 24 hours before application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Install with top of marker tray at 30 inches above finished floor.

C. Secure units level and plumb.

D. Butt Joints: Install with tight hairline joints.

3.04 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Cover with protective cover, taped to frame.

C. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION

SECTION 10 14 00
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and door signs.

B. Building identification signs.

1.02 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Qualifications: Submit Manufacturer's qualifications.

C. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

D. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
3. Submit for approval by Owner through Architect prior to fabrication.

E. Samples: Submit one sample of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

F. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

G. Verification Samples: Submit samples showing colors specified.

H. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 2017, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.

C. Building Identification Signs:

D. Dimensional Letter Signs: Wall-mounted.

2.03 TACTILE SIGNAGE MEDIA

A. Panel Signs
   1. Flat Signs: Signage media without frame.
      a. Material: Acrylic plastic.
      b. Edges: Square.
      c. Corners: Square.
      d. Total Thickness: 1/8 inch.
      e. Background Color: To be selected from Manufacturer's full range.
      f. Wall Mounting of One-Sided Signs: Tape adhesive and sealant.
         1) Where mounted on glass, provide blank panel sign of equal dimension on back side of glass.

B. Sign Types: As indicated on drawings.

2.04 DIMENSIONAL LETTERS

A. Metal Letters:
   1. Metal: Aluminum sheet, flat.
   2. Metal Thickness: 1/8 inch minimum.
   3. Letter Height: 16 inches and 21 inches.
   4. Text and Typeface:
      a. Character Font: As noted on the drawings.
      b. Character Case: Upper case only.
   5. Finish: Brushed, satin.
   6. Message: "JOHN G. LEACH."
   7. Mounting: Pin mounting.

B. Metal Letters:
   1. Metal: Aluminum sheet,box..
   2. Metal Thickness: 1/8 inch minimum.
   3. Letter Height: 16 inches and 21 inches.
   4. Letter Height: 112 inches, 96 inches, and 40 inches.
   5. Letter Depth: 1 inch.
   6. Text and Typeface:
      a. Character Font: As noted on the drawings.
      b. Character Case: Upper and lower case (title case).
   7. Finish: Painted; Black, grey, and red.
   8. Mounting: Concealed or exposed screws.

2.05 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

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SECTION 10 21 13.19
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic toilet compartments.

B. Urinal screens.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking and supports.

B. Section 10 28 00 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

C. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on panel construction, hardware, and accessories.

C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

D. Selection Samples: Submit full set of 2 inch by 2 inch samples for initial selection.

E. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design: Scranton Products; Hiny Hiders: www.scrantonproducts.com/#sle.

B. Solid Plastic Toilet Compartments:
   1. ASI Accurate Partitions: www.asi-accuratepartitions.com/#sle.
   2. ASI Global Partitions: www.asi-globalpartitions.com/#sle.
   3. Inpro: www.inprocorp.com/#sle.
   4. Metpar Corp: www.metpar.com/#sle.
   5. Scranton Products: www.scrantonproducts.com/#sle.
   6. Substitutions: Section 01 60 00 - Product Requirements.

2.02 PLASTIC TOILET COMPARTMENTS

A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted unbraced.
   1. Sight-proof configuration
   2. Color: As selected from manufacturer's full range.
   3. Doors:
      a. Thickness: 1 inch.
      b. Width: 24 inch.
      c. Width for Handicapped Use: 36 inch, out-swinging.

d. Height: 72 inch.

4. Panels:
   a. Thickness: 1 inch.
   b. Height: 72 inch.
5. Pilasters:
   a. Thickness: 1 inch.
   b. Width: As required to fit space; minimum 3 inch.
   c. Height: 83 inch.
6. Screens without Doors:
   a. Thickness: 1 inch.
   b. Height: 55 inch.
   c. Depth: 24 inch.
   d. Mount to wall with continuous brackets at each side. Mount to floor with shoe.

2.03 ACCESSORIES

A. Pilaster Shoes: Stainless steel, satin finish, 3 inches high; concealing floor fastenings.

B. Head Rails: Extruded aluminum, anti-grip profile.
   1. Size: Manufacturer's standard size.

C. Wall and Pilaster Brackets: Stainless steel; continuous type.

D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.

E. Hinges: Stainless steel, manufacturer's standard finish.
   1. Continuous-type hinge, self closing.

F. Door Hardware: Stainless steel, manufacturer's standard finish.
   1. Door Latch: Slide type with exterior emergency access feature.
   2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
   3. Provide door pull for outswinging doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach shoes to floors using anchor devices.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 21 23
CUBICLE CURTAINS AND TRACK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface mounted overhead curtain track and guides.

B. Cubicle curtains.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking and supports for track.

B. Section 09 51 00 - Acoustical Ceilings: Suspended ceiling system to support track.

1.03 REFERENCE STANDARDS

A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for curtain fabric characteristics and track supports.

C. Shop Drawings: Indicate a reflected ceiling plan view of curtain track, hangers and suspension points, attachment details, schedule of curtain sizes.

D. Samples: Submit 12 by 12 inch sample patch of curtain cloth with representative top, bottom, and edge hem stitch detail, heading with reinforcement and carrier attachment to curtain header.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Curtains: Two of each type and size.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept curtain materials on site and inspect for damage.

B. Store curtain materials on site and deliver to Owner for installation when requested.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cubicle Track and Curtains:
   1. A. R. Nelson Co: www.arnelson.com/#sle.
   2. Construction Specialties, Inc: www.c-sgroup.com/#sle.
   3. Inpro: www.inprocorp.com/#sle.

2.02 TRACKS AND TRACK COMPONENTS

A. Tracks: Extruded aluminum sections; one piece per track run.
   1. Profile: Channel.
   2. Mounting: Surface.
   3. Structural Performance: Capable of supporting vertical test load of 50 lbs without visible deflection of track or damage to supports, safely supporting moving loads, and sufficiently rigid to resist visible deflection and without permanent set.
   4. Track End Stop: To fit track section.
   5. Track Bends: Minimum 12 inch radius; fabricated without deformation of track section or impeding movement of carriers.
   6. Finish on Exposed Surfaces: Clear anodized.

B. Curtain Carriers: Nylon rollers, size and type compatible with track; designed to eliminate bind when curtain is pulled; fitted to curtain to prevent accidental curtain removal.

C. Wand: Plastic, attached to lead carrier, for pull-to-close action.

D. Installation Accessories: Types required for specified mounting method and substrate conditions.

2.03 CURTAINS

A. Cubicle Curtains:
   1. Inherently flame resistant or flameproofed; capable of passing NFPA 701 test.
   2. Material: Close weave polyester; anti-bacterial, self deodorizing, sanitized, and preshrunk.

B. Curtain Fabrication:
   1. Width of curtain to be 10 percent wider than track length.
   2. Length of curtain to end 6 inches above finished floor.
   3. Include open mesh cloth at top 20 inches of curtain for room air circulation, attached to curtain as specified above.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and supports above ceiling are ready to receive work of this Section.

B. Verify that field measurements are as indicated.

3.02 INSTALLATION

A. Install curtain track to be secure, rigid, and true to ceiling line.

B. Secure track to ceiling system.

C. Install end cap and stop device.

D. Install curtains on carriers ensuring smooth operation.

END OF SECTION

SECTION 10 22 39
FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Top-supported folding panel partitions, horizontal opening.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking and track support shimming.

B. Section 08 71 00 - Door Hardware: Lock cylinders for panels

1.03 REFERENCE STANDARDS

A. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation Between Spaces Separated by Operable Partitions; 2012 (Reapproved 2020).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on partition materials, operation, hardware and accessories, electric operating components, track switching components, and colors and finishes available.

C. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, static and dynamic loads, location and details of pass door and frame, adjacent construction and finish trim, and stacking depth.

D. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.

E. Samples for Review: Submit two samples of surface finish, 12 by 12 inches size, illustrating quality, colors selected, texture, and weight.

F. Manufacturer's Instructions: Indicate special procedures.

G. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified this section with minimum ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until installation.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design: Moderfold, Acousti-Seal Legacy, Paired Panel Operable Partition with Hinged Panel Closure.

B. Folding Panel Partitions - Horizontal Opening: Subject to compliance with requirements of drawings and specifications, products from the following manufacturers may be provided.
   1. Kwik-Wall Company: www.kwik-wall.com/#sle.
   2. Moderco, Inc: www.moderco.com/#sle.
   3. Modernfold, a DORMA Group Company: www.modernfold.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FOLDING PANEL PARTITIONS - HORIZONTAL OPENING

A. PANEL CONSTRUCTION
   1. Nominal 3-inch (76mm) thick panels in manufacturer's standard 48-inch (1220mm) widths. All panel horizontal and vertical framing members fabricated from minimum 16-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.
   2. Panel Skin Options (select one):
      a. Roll-formed 21-gage steel wrapping around panel edge. Panel skins shall be lock formed and welded directly to the frame for unitized construction. Acoustical ratings of panels with this construction (select one):
      b. 28 STC
   3. Hinges for Closure Panels, Pass Doors, and Pocket Doors shall be:
      a. Concealed laminated hinge with antifriction segments mounted between each heat-treated link. Hinge to be attached directly to panel frame. Welded internal hinge bracket shall support the hinge and allow for adjustment of hinge plates. Lifetime Warranty on hinges. Concealed hinges mounted into panel edge or vertical astragal are not acceptable.
   4. Panel Trim: No vertical trim required or allowed on edges of panels; minimal groove appearance at panel joints.
   5. Panel Weights:
      a. 28 STC - 6 lbs./square foot

B. PANEL FINISHES
   1. Panel face finish shall be (select as required):
      a. Reinforced heavy-duty vinyl with woven backing weighing not less than 30 ounces (850 g) per lineal yard.
   2. Panel trim: No exposed panel trim required or allowed; seals and hardware to be of one color.
      a. Smoke Gray

C. SOUND SEALS
   1. Vertical Interlocking Sound Seals between panels: Roll-formed steel astragals, with reversible tongue and groove configuration in each panel edge for universal panel operation. Rigid plastic or aluminum astragals or astragals in only one panel edge are not acceptable.
   2. Horizontal Top Seals: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.
   3. Horizontal Bottom Seals (select one):
      a. A2 - Automatic operable seals providing nominal 2-inch (51 mm) operating clearance with an operating range of +1/2-inch (13mm) to –1-1/2 inch (38 mm) which automatically drop as panels are positioned, without the need for tools or cranks.

D. SUSPENSION SYSTEM
   1. #14 Suspension System
      a. Suspension Tracks: Minimum 7-gage, 0.18-inch (5 mm) roll formed steel. Track shall be supported by adjustable steel hanger brackets connected to structural support pairs of 1/2-inch (13mm) diameter threaded rods. Brackets must support the load bearing surface of the track.
         1) Exposed track soffit: Steel, removable for service and maintenance, attached to track bracket without exposed fasteners, and pre-painted off-white.
      b. Carriers: One all steel trolley with steel-tired ball bearing wheels per panel (except hinged panels). Non-steel tires are not acceptable.
      c. Warranty period: Twenty (20) years.

E. OPTIONS
1. Single Pass Doors:
a. Matching pass door same thickness and appearance as panels. ADA-compliant pass door to be trimless and equipped with friction latch and flush pulls for panic operation. No threshold will be permitted.
b. Hardware:
1) Lever handles both sides of door.
(a) Office lock function.
(b) Free egress from inside at all times.
(c) Keyed to match gym office lock.
2. Available Accessories/Options:
a. Pocket Doors: Acousti-Seal Pocket Doors by Modernfold, Inc. (see supplement specification)
1) Legacy pocket door
2) Premier pocket door
b. Finished end caps.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify track supports are laterally braced and will permit track to be level within 1/4 inch of required position and parallel to the floor surface.

C. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.

D. Verify wall plumbness of 1/8 inch in 10 feet, non-cumulative.

3.02 INSTALLATION

A. Install partition in accordance with manufacturer's instructions and ASTM E557.

B. Fit and align partition assembly level and plumb.

C. Lubricate moving components.

3.03 ADJUSTING

A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.

B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.

C. Adjust partition assembly to achieve lightproof seal.

3.04 CLEANING

A. Clean finish surfaces and partition accessories.

3.05 CLOSEOUT ACTIVITIES

A. Demonstrate operation of partition and identify potential operational problems.

END OF SECTION

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SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

B. Protective wall covering.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking for wall and corner guard anchors.

B. Section 09 21 16 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

1.03 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).

B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2021.

C. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies; 2014.

D. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

1.04 SYSTEM DESCRIPTION OF WALL PANELING

A. Performance Requirements: Provide wall rigid sheet that conforms to the following requirements of regulatory agencies and the quality control of the manufacturer.
   1. Fire Performance Characteristics: Provide sheet material conforming with the NFPA Class A fire rating. Surface burning characteristics, as determined by ASTM E-84, shall be flame spread of 25 or less and smoke development of 450 or less.
   2. Impact Strength: Provide materials that have been tested in accordance with the applicable provisions of ASTM D-256, Impact Resistance of Plastics.
   3. Chemical and Stain Resistance: Provide material that shows resistance to stain when tested in accordance with applicable provisions of ASTM D-543.
   4. Fungal and Bacterial Resistance: Provide material that does not support fungal or bacterial growth as tested in accordance with ASTM G-21 and ASTM G-22.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements.

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Shop Drawings: Include plans, elevation, sections, and attachment details. Show design and spacing of supports for protective corridor handrails, required to withstand structural loads.

D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
   1. Submit two sections of corner guards, bumper rails, and protective corridor handrails, 24 inches long.
   2. Submit two samples of protective wall covering and door surface protection, 6 by 6 inches square.

E. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Stock Materials: Five package(s) of minimum 96 inches long unit of each kind of covers for corner guards.
3. Extra Stock Materials: 40 square feet of each kind of protective wall covering and door surface protection.

H. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from moisture damage.

C. Protect work from UV light damage.

D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for metal crash rails. Complete forms in Owner's name and register with manufacturer.
   1. Failures include, but are not limited to, the following:
      a. Structural failures or internal connection failures.
      b. Deterioration of materials beyond that expected of normal use, as intended by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards:
   1. Babcock-Davis: www.babcockdavis.com/#sle.
   2. Construction Specialties, Inc: www.c-sgroup.com/#sle.
   3. Inpro: www.inprocorp.com/#sle.
   4. Koroseal Interior Products: www.koroseal.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Protective Wall Covering:
   1. Construction Specialties, Inc: www.c-sgroup.com/#sle.
   2. Inpro: www.inprocorp.com/#sle.
   3. MDC Interior Solutions: www.mdcwall.com/#sle.
   4. Pawling Corp: www.pawling.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.

B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance complying with applicable provisions of ASTM D543.

C. Fungal Resistance: Unless otherwise noted, provide protection products and assemblies which pass ASTM G21 testing.

2.03 PRODUCT TYPES

A. Corner Guards - Surface Mounted:
   1. Basis-of-Design: Inpro, BluNose High Impact Surface Mount Bullnose Corner Guard System, with top and bottom caps of injection molded thermoplastic.
   2. Performance:
      a. Fire Performance Characteristics: Provide UL Classified corner guards conforming with NFPA Class A fire rating. Surface burning characteristics, as determined by UL-723 (ASTM E-84), shall be flame spread of 10 and smoke development of 350 - 450. Provide ULC (Canada) listed corner guards conforming to the requirements of the National Building Code of Canada 2010, Subsection 3.1.13. Surface burning characteristics, as determined by CAN/ULC-S102.2, shall be flame spread of 15 and smoke developed of 35.
      b. Self-Extinguishing: Provide corner guards with a CC1 classification, as tested in accordance with the procedures specified in ASTM D-635-74, Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position, as referenced in UBC 52-4-1988.
      c. Impact Strength: Provide rigid vinyl profile materials that have an Impact Strength of 30.2 ft-lbs/inch of thickness as tested in accordance with the procedures specified in ASTM D-256-90b, Impact Resistance of Plastics.
      d. System Impact Resistance: Provide a corner guard system that resists an impact of 153.9 ft-lbs while producing no visual blemishes upon the vinyl cover surface and no deformations in the vinyl retainers, as tested in accordance with the applicable provisions of ASTM F 476-84, paragraph 18, Impact Test.
      e. Chemical and Stain Resistance: Provide corner guards that show resistance to stain when tested in accordance with applicable provisions of ASTM D-543.
      f. Fungal and Bacterial Resistance: Provide rigid vinyl that does not support fungal or bacterial growth as tested in accordance with ASTM G-21 and ASTM G-22.
      g. Color Consistency: Provide components matched in accordance with SAE J-1545 - (Delta E) with a color difference no greater than 1.0 units using CIE Lab, CIE CMC, CIE LCh, Hunter Lab or similar color space scale systems.
   3. Material: High impact 0.080 inch vinyl with full height extruded aluminum retainer and top and bottom caps of injection molded thermoplastic.
   4. Width of Wings: 3 inches.
   5. Corner: Radiused.
   6. Color: As selected from manufacurer's full range..
   7. Length: One piece, 9 feet long.
   8. Preformed end caps.

B. Dgitally Printed Protective Wall Covering:
   1. Basis-of-Design: Inpro, Palladium Rigid Sheet G2.
   2. Performance:
      a. Fire Performance Characteristics: Conforming with the NFPA Class A fire rating. Surface burning characteristics as determined by ASTM E-84; maximum flame spread of 25 and a maximum smoke developed of 450.
      b. Chemical and Stain Resistance: Resistance to stain when tested in accordance with applicable provisions of ASTM D-543.
      c. Graffiti Resistance: Resistance to staining agents when tested in accordance with applicable provisions of ASTM D6578.
      d. Fungal and Bacterial Resistance: Does not support fungal or bacterial growth as tested in accordance with ASTM G-21 and ASTM G-22.
      e. Taber Abrasion Resistance: Resistance to abrasion when tested to applicable provisions of ASTM D 4060.
      f. System Impact Resistance: Resists an impact of 66.13 ft-lbs while producing an indentation of less than 3/8” as tested in accordance with applicable provisions of ASTM F 476-84, Impact Test.

3. Materials:
    a. Sheet material shall be extruded from chemical and stain-resistant PETG with a matte finish. Rigid sheet shall be reverse printed with digital graphics. Printed sheet shall have a protective backing.
    b. Sheet Size: 48 inch x 120 inch x 0.040 inch.
    c. Pattern: As selected from manufacturer's full range..
    d. Texture: Suede.
        1) Texture Direction: Vertical.
    e. Accessories: Provide manufacturer's standard non-PVC color-matched trim and moldings.
        1) Outside Corner Trim: Standard angle, 0.110 inch retainer and 0.060 inch cover.
        2) Top Edge: Standard J-trim, G2-407.
    f. Joints:
        1) Vertical Joint: 1/16 inch gap with color match sealant.
        2) Inside Corner: 1/16 inch gap with color match sealant.
    g. Mounting: Adhesive.

C. Adhesives and Primers: As recommended by manufacturer.

D. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.

2.04 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that field measurements are as indicated on drawings.

C. Verify that substrate surfaces for adhered items are clean and smooth.
1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.

D. Start of installation constitutes acceptance of project conditions.

3.02 PREPARATION

A. Surface Prep: Prior to installation, clean the substrate to remove dust, debris and loose particles. Ensure the substrate is sound and per project plans.

B. Acclimate product in temperatures between 65°F and 80°F [18°-27°C] and a humidity level less than 80% 24 hours in advance of installation.

C. The area of installation must temperature and humidity controlled for at least 48 hours after installation.

3.03 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position corner guard 4 inches above finished floor to 100 inches high.

C. Position protective wall covering at top of floor base
1. Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.
2. Apply adhesive with 1/8 inch V-notch trowel to an area of wall surface that can be completed within cure time of the adhesive.

3. Install trim pieces as required for a complete installation. Allow tolerance for thermal movement.
4. At joints indicated to be caulked, allow for a minimum 1/16 inch wide gap between edges of sheets. Gaps are required to be of consistent width throughout the project.
5. Use a roller to ensure maximum contact with adhesive.
6. At inside and outside corners cut covering sheets to facilitate installation of trim pieces or corner guards.

3.04 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/8 inch.

3.05 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

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SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Commercial shower and bath accessories.

C. Under-lavatory pipe supply covers.

D. Electric hand/hair dryers.

E. Diaper changing stations.

F. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00: Concealed supports for accessories, including in wall framing and plates.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a (Reapproved 2019).

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

D. ASTM C1036 - Standard Specification for Flat Glass; 2011.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

F. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008 (Reapproved 2013).

G. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2015.

H. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2022.

I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Schedule: Submit schedule indicating accessories, quantity and location.

D. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. Basis-of-Design: Bobrick.
   2. Subject to compliance with requirements of the specifications, products from the following manufacturers may be specified.
   3. American Specialties, Inc: www.americanspecialties.com/#sle.
   4. Bobrick Washroom Equipment, Inc: www.bobrick.com

5. Bradley Corporation: www.bradleycorp.com/#sle.
6. Substitutions: Section 01 60 00 - Product Requirements.

B. Provide products of each category type by single manufacturer.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Stainless Steel Sheet: ASTM A666, Type 304.

C. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

D. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Powder-Coated Steel: Clean, degrease, and neutralize. Follow immediately with a phosphatizing treatment, prime coat, and two finish coats of powder coat enamel.

C. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Refer to Schedule on Drawings.

B. Hygiene Support System: Wall mounted sit to stand transfer system
1. Fixed or pivot configuration to be determined.
2. Minimum user height: 46 inches.
3. Maximum working load: 250 lbs.
4. Include optional support strap and handholds.
5. Basis of Design: Rifton K710

2.05 COMMERCIAL SHOWER AND BATH ACCESSORIES

A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners.

B. Shower Curtain:
1. Material: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
2. Size: 72 by 72 inches, hemmed edges.
3. Color: As selected from manufacturer's standard colors.
4. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.

C. Wall-Mounted Soap Dish: Heavy duty, seamless stainless steel, surface-mounted with drain holes, without grab bar, satin finish; with concealed mechanical fastening suitable for substrate and backplate.

D. Robe Hook: Heavy-duty stainless steel, double-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.

2.06 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
1. Insulate exposed drainage piping including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
2. Construction: 1/8 inch flexible PVC.
3. Color: White.
4. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.
5. Basis-of-Design: ISP Corporation: Trubro, Lav Sheild.
6. Products:

a. Plumberex Specialty Products, Inc.: www.plumberex.com/#sle.
b. Truebro, ISP Corporation; ISP Plumbing Products.com/#sle.
c. Zurn Industries, LLC; www.surn.com/#sle. .
d. Substitutions: See Section 01 60 00 - Product Requirements.

2.07 ELECTRIC HAND/HAIR DRYERS

A. Electric Hand Dryers: Traditional fan-in-case type, with downward fixed nozzle.
1. Operation: Automatic, sensor-operated on and off.
2. Mounting: Wall-mounted - surface.
3. Cover: Plastic.
a. Tamper-resistant screw attachment of cover to mounting plate.
b. Screened or shielded air intake.
4. Air Velocity: 4,000 linear feet per minute, minimum.
5. Heater: 500 W, minimum, at full power.
6. Total Wattage: 1800 W, maximum.
7. Runtime as Hand Dryer: 30 seconds, nominal.
8. Supply Voltage: As indicated on drawings.
9. Warranty: 3 years.
10. Electric Hand Dryer Products:
a. Basis of Design: World Dryer Corporation; Nova 5: www.worlddryer.com/#sle.

2.08 DIAPER CHANGING STATIONS

A. Group Bathroom Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
1. Material: Stainless steel.
2. Mounting: Surface.
3. Minimum Rated Load: 250 pounds.
4. Products:
a. Basis of Design: Foundations Premier Stainless Extended Length Changing Table.
b. Or approved equal.

2.09 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
1. Hooks: Four, 0.06 inch stainless steel rag hooks at shelf front.
2. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
3. Length: Manufacturer's standard length for number of holders/hooks.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

D. See Section 06 10 00 for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.03 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

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SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements and Section 01 33 00 - Submittal Procedures, for submittal procedures.

B. Product Data: Fire extinguishers and cabinets.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
   2. Larsen's Manufacturing Company: www.larsens.com
   3. Nystrom, Inc: www.nystrom.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
   2. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
   3. Nystrom, Inc: www.nystrom.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gage.
   1. Basis-of-Design: Larsens Manufacturing, MP10.
   2. Class: 4A 80B:C type.
   3. Size: 10 pound.
   4. Finish: Baked polyester powder coat, red color.

2.03 FIRE EXTINGUISHER CABINETS

A. Basis-of-Design: Larsens Manufacturing, Architectural Series with Vertical Duo Door.

B. Cabinet Construction: Non-fire rated.

C. Cabinet Configuration: Semi-recessed type.
   1. Size to accommodate accessories.
   2. Trim to accommodate depth of wall.

D. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.

E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

F. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.

G. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Cabinet Signage: On cabinet door.

C. Lettering: “FIRE EXTINGUISHER” decal, or vinyl self-adhering, prespaced red lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Place extinguishers in cabinets.

END OF SECTION

SECTION 10 51 13
METAL LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal lockers.

B. Locker benches.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete base construction.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's published data on locker construction, sizes, and accessories.

C. Shop Drawings: Indicate locker plan layout, numbering plan and combination lock code.
   1. Wired Access Control: Provide schematic system riser diagram indicating component interconnections. Include requirements for interface with other systems.

D. Samples: Color selection kit including manufacturer's full range of colors on 2 inch by 3 inch metal chips.

E. Manufacturer's Installation Instructions: Indicate component installation assembly.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Lockers:
   1. Basis of Design: Penco Products, Inc., Vanguard.
   2. Available Manufacturers: Subject to compliance with drawings and specifications, products from the following manufacturers may be provided.
      a. Penco Products, Inc; ____: www.pencoproducts.com/#sle.
      b. Republic Storage Systems Co; ____: www.republicstorage.com/#sle.
      c. Tennsco Storage; Steel Lockers: www.tennsco.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LOCKER APPLICATIONS

A. Staff Lockers: Metal lockers, wall mounted with concrete base.
   1. Width: 15 inches.
   2. Depth: 15 inches.
   3. Height: 72 inches.
   4. Configuration: Two tier.
   5. Fittings: Size and configuration as indicated on drawings.
      a. Hat shelf.
      b. Hooks: Two single prong.
   6. Ventilation: Louvers at top and bottom of door panel.
   7. Locking: Padlock hasps, for padlocks provided by Owner.
   8. Provide sloped top.
   9. Color: To be selected from manufacturer's full range by Architect.

2.03 METAL LOCKERS

A. Accessibility: Design units indicated on drawings as "accessible" to comply with ICC A117.1 and ADA Standards.

B. Locker Case Construction:
   1. Standard-Duty, Knocked Down Construction: Made of formed sheet steel; metal edges finished smooth without burrs; baked enamel or powder coat finished inside and out.
      a. Locker Body Components: Formed and flanged from steel sheet of the following type and minimum thicknesses:
         1) Unperforated Steel Sheet: Commercial Steel (CS), Type B, supplied for exposed applications and complying with ASTM A1008/A1008M and the following:
      b. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
         1) Door Frame: 16 gauge, 0.0598 inch, minimum.
      c. Where ends or sides are exposed, provide flush panel closures.
      d. Provide filler strips where indicated, securely attached to lockers.

C. Doors: Channel edge; welded construction, manufacturer's standard stiffeners, grind and finish edges smooth.
   1. Door Thickness: 16 gauge, 0.0598 inch, minimum.
   2. Form recess for operating handle and locking device.

D. Latches and Door Handles:.
   1. Latching: Manufacturer's standard for locking arrangement selected.
      a. Three-Point Lift Handle Gravity Latch: Pocket-mounted, provide for doors 18 inches or taller.

E. Cup, Pocket: Manufacturer's standard, with integral pull, and recessed surface punched for installation of lock, latch lift mechanism, and number plate.

F. Hinges: Heavy-duty, 7-knuckle type; two for doors under 42 inches high; three for doors over 42 inches high.

G. Sloped Top: 20 gauge, 0.0359 inch, with closed ends.

H. Trim: 20 gauge, 0.0359 inch.

I. Coat Hooks: Stainless steel or zinc-plated steel.

J. Number Plates: Provide rectangular shaped aluminum plates. Form numbers minimum 3/8 inch high of block font style with ADA designation, in contrasting color.

2.04 LOCKER BENCHES

A. Manufacturers:
   1. Gilmore-Kraper Company; www.gilmoregramer.com.
   2. Lyon; www.lyonworkspace.com.
   3. Republic Storage Products; www.republicstorage.com.
   4. Robinson Steel Company; www.rslockers.com.
   5. Salsbury Insustries; www.lockers.com.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

B. Verify bases and embedded anchors are properly sized.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Place and secure on prepared base.

C. Install lockers plumb and square.

D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.

E. Bolt adjoining locker units together to provide rigid installation.

F. Install end panels, filler panels, and sloped tops.

G. Install fittings if not factory installed.

H. Replace components that do not operate smoothly.

3.03 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION

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SECTION 10 51 26
PLASTIC LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic lockers.

B. Locker benches.

1.02 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.

C. Shop Drawings: Indicate locker plan layout, numbering plan and combination lock code.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid Plastic Lockers and benches:
   1. ASI Storage Solutions: www.asi-storage.com/#sle.
   2. Columbia Lockers, a division of PSiSC; PolyLife Lockers: www.psisc.com/#sle.
   3. Scranton Products; Tuftec: www.scrantonproducts.com/#sle.

2.02 LOCKER APPLICATIONS

A. Student Lockers: Solid plastic lockers, recessed mounted.
   1. Width: 15 inches.
   2. Depth: 18 inches.
   3. Height: 72 inches.
   4. Locker Configuration: Single tier.
   5. Fittings: Size and configuration as indicated on drawings.
      a. Hat shelf.
      b. Single shoe shelf.
      c. Hooks: One double prong.
   6. Ventilation: By open space between the back of the door and locker body.
   7. Locking: Padlock hasps, for padlocks provided by Owner.

B. Locker Benches: Free standing type; bench top of solid high density polyethylene (HDPE); aluminum pedestal pedestals.
   1. Bench tops shall be 1 - 1/4 inches thick with all edges rounded to a 1/4 inch (6 mm) radius.
   2. Aluminum pedestals shall be 16 inches (406 mm) high, and secured to bench tops with stainless steel tamper resistant Torx head screws and secured to the floor using lead expansion shields with 2 inches (51 mm) stainless steel Phillips head machine bolts.
   3. Width: 42 inches.
   4. Height: 39" inch.
   5. Depth: 23" inch.

2.03 SOLID PLASTIC LOCKERS

A. Lockers: Factory assembled, made of solid plastic panels, tested in accordance with NFPA 286, homogenous color throughout.
   1. Material: Solid high density polyethylene (HDPE).

2. Doors: Full overlay without frame.
3. Locker Body Construction: Manufacturer's standard for selected product.
4. Where locker ends or sides are exposed, provide same finish as fronts or provide extra panels to match fronts.
5. Provide filler strips where indicated, securely attached to lockers.
6. Door Color: To be selected by Architect.
7. Body Color: Manufacturer's standard white or light color.

B. Component Thicknesses:
1. Doors: 1/2 inch minimum thickness.
2. Locker Body: Tops, bottoms, backs, and shelves 3/8 inch minimum.
3. End Panels and Filler Panels: 1/2 inch minimum thickness.
4. Toe Kick Plates: 1/2 inch minimum thickness.

C. Hinges: Full height of locker, manufacturer's standard heavy duty type.

D. Coat Hooks: High impact plastic.

E. Number Plates: Provide rectangular shaped aluminum plates. Form numbers 2 inch high of block font style with ADA designation, in contrasting color.

F. Built-In Lock Boxes: Same material as locker, manufacturer's standard size, with padlock hasps, for padlocks provided by Owner.

G. Locker Base: Solid plastic base, 4 inches high, field assembled.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

B. Verify bases and embedded anchors are properly sized.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Place and secure on prepared base.

C. Install lockers plumb and square.

D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds.

E. Install end panels, filler panels, and sloped tops.

F. Install fittings if not factory installed.

G. Replace components that do not operate smoothly.

3.03 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 10 56 13
METAL STORAGE SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Four post shelving.

B. Post and beam rivet shelving with wood shelves.

C. Shelving accessories.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ANSI MH28.1 - American National Standard for the Design, Testing, Utilization and Application of Industrial Grade Steel Shelving - Specifications; 1997.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements and Section 01 33 00 - Submittal Procedures, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Rated uniform shelf loads.
   2. Details of shelving assemblies, including reinforcement.
   3. Accessories.

C. Test Reports: Provide independent agency test reports documenting compliance with specified structural requirements.

D. Executed warranty.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Inspect for dents, scratches, or other damage. Replace damaged units.

B. Store in manufacturer's unopened packaging until ready for installation.

C. Store under cover and elevated above grade.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer Warranty: Provide 1-year manufacturer warranty for rust, corrosion, and manufacturing defects. Complete forms in Owner's name and register with manufacturer.

C. Provide one year manufacturer warranty covering defects of manufacturing and workmanship and rust and corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Post and Beam Rivet Shelving: Subject to compliance with requirements of drawings and specifications, products from the following manufacturers may be provided.
   1. ASI Storage Solutions: www.asi-storage.com/#sle.
   2. Hallowell: www.hallowell-list.com/#sle.
   3. Penco Products, Inc : www.pencoproducts.com.
   4. Tennsco Storage: www.tennsco.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SHELVING - GENERAL

A. Shelving: Provide products tested to comply with ANSI MH28.1 for design criteria, lateral stability, shelf connections, and shelf capacity.

B. Anchors: Provide anchoring hardware to secure each shelving unit to floor and wall.
   1. Provide hardware of type recommended by manufacturer for substrate.

2.03 RIVET SHELVING

A. Basis-of-Design: Penco Products, Inc., RivetRite Shelving.

B. Rivet Shelving: Steel post-and-beam type with sway bracing, shelving brackets, shelving surfaces, and accessories as specified.
   1. Unit Width: 36 inches, center to center of posts.
   2. Shelf Depth: 24 inches, minimum.
   3. Shelf Quantity: Six per unit.
   4. Unit Height: 120 inches, overall.
   5. Finish: Baked enamel, medium gloss.
   6. Number of Units: 16.

C. Posts and Beams: Formed sheet members; perforations may be exposed on face of members.
   1. Heavy-duty, double rivet.

D. Shelves: Wood
   1. Shelf Material: 3/4" particle board.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate is level and that clearances are as specified.

B. Verify that walls are suitable for shelving attachment.

C. Do not begin installation until substrates have been properly prepared.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor and reinforce as specified and as recommended by manufacturer.

C. Anchor shelving units to wall.

D. Install shelving with shelf surfaces level and vertical supports plumb; adjust feet and bases as required.

E. Out-Of-Square Tolerance - Four Post Shelving: Maximum of 1/8 inch difference in distance between bottom shelf and canopy top, measured along any post in any direction.

3.04 CLEANING

A. Clean shelving and surrounding area after installation.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.06 SCHEDULE

A. Install shelves at Receiving 153C.

END OF SECTION

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SECTION 10 73 16.13
METAL CANOPIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Attached metal canopies.

1.02 RELATED REQUIREMENTS

A. Section 07 61 00 - Sheet Metal Roofing: Canopy roof.

B. Section 07 71 23 - Manufactured Gutters and Downspouts.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.

B. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014, with Editorial Revision (2017).

D. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2018.

E. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

H. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2020.

I. ASTM E2950 - Standard Specification for Metal Canopy Systems; 2014 (Reapproved 2020).

J. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2022.

K. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2019, with Editorial Revision (2020).

L. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014 (Amended 2015).

M. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Submit product data sheets, including material descriptions and finishes, and preparation instructions and recommendations.

C. Shop Drawings: Prior to commencement of fabrication, submit detailed shop drawings, showing profiles, sections of components, finishes, and fastening details.

D. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.

E. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.

C. Erector Qualifications: Company specializing in performing the work of this section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver materials to project site ready for erection.

C. Package using methods that prevent damage during shipping and storage on site.

D. Store materials under cover and elevated above grade.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Metal Canopies: Correct defective work within a two year period after Date of Substantial Completion.

C. Finish Warranty: Provide manufacturer's one year warranty on factory finish against cracking, peeling, and blistering.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Canopies:
   1. Basis of Design: Lumishade by Mapes Canopies.
   2. Duo-Gard: www.duo-gard.com.
   3. Lawrence Fabric & Metal Structures, Inc: www.lawrencefabric.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 METAL CANOPIES

A. Shop Fabricated Steel Canopy
   1. Pre-engineered steel system complying with ASTM E2950.

B. Configuration: Layout and dimensions, column layout, canopy clearance, fascia profile, and roof covering design as indicated on drawings.
   1. Installation: Cantilever-mounted to building structure with tension members.
   2. Structural Framing System: Steel.
   3. Covering Material: Steel.
   4. Drainage Concept: Water collected in decking conducted into perimeter drain beams and discharged through scuppers.

C. Performance Requirements:
   1. Design and fabricate metal canopy system to resist wind, snow, live, and seismic loads without failure, damage, or permanent deflection in accordance with ASCE 7:
      a. Loads: In compliance with local building codes.

2.03 COMPONENTS

A. Structural Aluminum Framing: Alloy and temper 6063-T5, 6063-T6, or 6061-T6.
   1. Extruded Shapes and Tubes: ASTM B221 (ASTM B221M).
   2. Rolled or Extruded Structural Shapes: ASTM B308/B308M.
   3. Sheet and Plate: Alloy 5052, 5005, or 6061-T651, ASTM B209/B209M.

B. Covering:
   1. Aluminum Decking:
      a. Interlocking extruded aluminum decking modules.
         1) Extruded Decking: ASTM B221 (ASTM B221M), Alloy and temper 6005-T5, 6061-T6, or 6063-T6.
      b. Decking Orientation: Perpendicular to sidewalk.
   2. Aluminum Standing Seam Panels: See Section 07 61 00.

C. Fascia: Manufacturer's standard flat profile.

D. Anchor Bolts: ASTM A307 or ASTM A572/A572M, formed with bent shank, assembled with template for casting into concrete.
   1. Minimum exposed thread of 7 inches above footing and 23 inch minimum embedment.
   2. Provide nuts and washers as required for column leveling and plumbing.

E. Exposed Gutters and Downspouts: Aluminum with AAMA 2605 organic coating, color to match canopy covering, manufacturer's recommended size for canopy specified.

2.04 SHOP FABRICATION

A. Provide a complete system ready for erection at project site.

B. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.

C. Weld aluminum members in accordance with AWS D1.2/D1.2M.

D. Fabricate connections for bolt, nut, and washer connectors.

2.05 FINISHES

A. Aluminum Framing and Decking:
   1. Superior Performing Organic Coatings: AAMA 2605, multiple coats, thermally cured, polyvinylidene fluoride system.
   2. Color: Ftom manufacturer's full range.

B. Fascia: Fluoropolymer finish; color as selected from manufacturer's standard range.

2.06 ACCESSORIES

A. Structural Bolts: ASTM F3125/F3125M, Grade A325, minimum 3/4 inch diameter.

B. Trim, Closure Pieces, and Flashings: Same material, thickness and finish as sheet metal decking; factory-fabricated to required profiles.
   1. Exposed Fasteners: Not permitted.

C. Fasteners, Non-Structural: ASTM F593 stainless steel or ASTM A307 carbon steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates and site area for conditions that might prevent satisfactory installation.

B. Verify that foundation, electrical utilities, and placed anchors are in correct position.

C. Do not proceed with installation until all conditions are satisfactory.

3.02 INSTALLATION - FRAMING

A. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation.

B. Set column base plates with non-shrink grout to achieve full plate bearing.

C. Fasten columns to anchor bolts.

D. Do not field cut or alter structural members without approval.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 INSTALLATION - CANOPY COVERING

A. Install in accordance with manufacturer's instructions.

B. Fasten metal decking to metal support members, aligned level and plumb.

C. Install fascia panels, trim, and flashing.

D. Separate dissimilar metals using concealed bituminous paint.

E. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

END OF SECTION

SECTION 10 75 00
FLAGPOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum Flagpoles.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete base and foundation construction.

B. Section 31 23 23 - Fill: Sand to fill foundation tube sleeve.

1.03 REFERENCE STANDARDS

A. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains; 2016 (Reapproved 2020).

B. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2016.

C. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles; 2007.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pole, accessories, and configurations.

C. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design flagpole foundation under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed the State in which the Project is located.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.

B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flagpoles:
   1. Concord American Flagpole: www.concordamericanflagpole.com/#sle.
   2. Morgan-Francis Flagpoles & Accessories: www.morgan-francis.com/#sle.
   3. Pole-Tech Co, Inc: www.poletech.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FLAGPOLES

A. Flagpoles: Designed in accordance with NAAMM FP 1001.
   1. Material: Aluminum.
   2. Design: Cone tapered.
   3. Mounting: Ground mounted type.
   4. Nominal Height: 25 ft; measured from nominal ground elevation.
   5. Halyard: Internal type, manual winch operation.

2.03 POLE MATERIALS

A. Aluminum: ASTM B241/B241M, 6063 alloy, T6 temper.

2.04 ACCESSORIES

A. Finial Ball: Aluminum, 6 inch diameter.

B. Halyard: 5/16 inch diameter nylon, braided, white.

C. Primer: Zinc chromate type.

2.05 OPERATORS

A. Hand Crank: Removable _____ type.

2.06 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M 36, corrugated 16 gauge, 0.0598 inch steel, galvanized, depth of 24 inches as indicated.

B. Pole Base Attachment: Tube; steel base with base cover.

C. Outrigger Wall Support Assembly: Plain type, of same material as flagpole with through wall anchorages, mounting plates, and brace.

2.07 FINISHING

A. Metal Surfaces in Contact With Concrete: Asphaltic paint.

B. Aluminum: Mill finish.

C. Finial: Clear anodized finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.

B. Fill foundation tube sleeve with concrete specified in Section 03 30 00.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1 inch.

3.05 ADJUSTING

A. Adjust operating devices so that halyard and flag function smoothly.

END OF SECTION

SECTION 11 13 13
LOADING DOCK BUMPERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Loading dock bumpers of reinforced rubber pads with attachment frame.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories: Placement of loading dock bumper frame anchors into concrete.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on unit dimensions, method of anchorage, and details of construction.

C. Manufacturer's Installation Instructions: Submit installation requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Loading Dock Bumpers:
   1. Blue Giant Equipment Corporation: www.bluegiant.com/#sle.
   2. Chalfant Sewing Fabricators, Inc: www.chalfantusa.com/#sle.
   3. Durable Corp: www.durablecorp.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

A. Loading Dock Bumpers: Molded rubber, ozone resistant, nylon reinforced, Shore A Durometer of 70, minimum, and tensile strength of 950 to 1050 psi, minimum.
   1. Projection From Wall: 6 inches, minimum.
   2. Vertical Height: 18 inches, minimum.
   3. Width: 10 inches, minimum.
   4. Profile: Rectangular.

B. Attachment Hardware: 3/4 inches diameter galvanized bolts with expansion shields.

C. Touch-up Primer: Zinc rich type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that anchor placement is acceptable.

3.02 INSTALLATION

A. Install dock bumpers in accordance with manufacturer's instructions.

B. Set plumb and level.

C. Secure angled end frames to concrete; refer to Section 03 10 00 for additional information.

D. Weld angled end frames to steel dock frame, and touch up welds with primer.

END OF SECTION

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SECTION 11 21 00
COMMERCIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances.

B. Laundry appliances.

1.02 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping: Plumbing connections for appliances.

B. Section 26 27 17 - Equipment Wiring: Electrical connections for appliances.

1.03 REFERENCE STANDARDS

A. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements and Section 01 33 00 - Submittal Procedures, for submittal procedures.

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

C. Gas Appliances: Bearing design certification seal of AGA.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.

C. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

A. All Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Refrigerator, EQ-4: Free-standing, top-mounted freezer, and frost-free.
   1. Capacity: Total minimum storage of 20 cubic ft; minimum 15 percent freezer capacity.
   2. Energy Usage: Minimum 20 percent more energy efficient than energy efficiency standards set by U.S. Department of Energy (DOE).
   3. Features: Include glass shelves and lock.
   4. Exterior Finish: Porcelain enameled steel, color as indicated.
   5. Basis of Design: CTR21WLLF2 by Accucold.
   6. Manufacturers:
      a. American Biotech Supply: https://americanbiotechsupply.com/.
      b. Corepoint Scientific: https://corepointscientific.com/.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LAUNDRY APPLIANCES

A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Clothes Washer, EQ-2: Front-loading.

1. Size: 75 pounds. 10.6 cubic feet..
2. Finish: Painted steel, color white.
3. Basis of Design: W5300H by Electrolux.
4. Manufacturers:
    a. Maytag Commercial: www.maytagcommericallaundry.com.
    b. UniMac: https://unimac.com.
    c. Substitutions: See Section 01 60 00 - Product Requirements.

C. Clothes Dryer, EQ-1: Natural gas, stationary.
1. Size: 83 pounds. 23.8 cubic feet..
2. Basis of Design: T5675 by Electrolux.
3. Manufacturers:
    a. Maytag Commercial: www.maytagcommericallaundry.com.
    b. UniMac: https://unimac.com.
    c. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are present and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.03 ADJUSTING

A. Adjust operating equipment to efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment.

B. Wash and clean equipment.

END OF SECTION

SECTION 11 30 13
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances.

B. Laundry appliances.

1.02 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping: Plumbing connections for appliances.

B. Section 26 27 17 - Equipment Wiring: Electrical connections for appliances.

1.03 REFERENCE STANDARDS

A. ICC (IMC)-2021 - International Mechanical Code; 2021.

B. ICC (IRC)-2021 - International Residential Code for One- and Two-Family Dwellings; 2021.

C. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

D. UL 2158A - Clothes Dryer Transition Duct; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than twenty years of documented experience.

B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.

C. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Refrigerator, EQ-3: Free-standing, bottom-mounted freezer, and frost-free.
   1. Capacity: 17.70 cubic ft, total.
      a. Refrigerator Capacity: 12.99 cubic ft.
      b. Freezer Capacity: 4.74 cubic ft.
   2. Capacity: Total minimum storage of 18 cubic ft; minimum 15 percent freezer capacity.
   3. Exterior Finish: Stainless steel, color as indicated.
   4. Basis-of-Design: GE, GBE17HYRFS.
   5. Manufacturers: Subject to compliance with drawings and specifications, products from the following manufacturers may be provided.
      a. Frigidaire Home Products: www.frigidaire.com/#sle.
      b. GE Appliances: www.geappliances.com/#sle.
      c. Whirlpool Corp: www.whirlpool.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Range, EQ-9: Electric, free-standing, with glass-ceramic cooktop.
   1. Quantity: 1
   2. Location: Vocational Independent Living Classroom - 165
   3. Size: 30 inches wide.
   4. Oven: Self-cleaning with electronic ignition.
   5. Elements: Four (4).
   6. Controls: Solid state electronic.
   7. Features: Include automatic meat thermometer, storage drawer, oven door window, and oven light.
   8. Exterior Finish: Stainless steel, color as indicated.
   9. Basis-of-Design: GE, GRS500PVSS.
   10. Manufacturers:
      a. Frigidaire Home Products: www.frigidaire.com/#sle.
      b. GE Appliances: www.geappliances.com/#sle.
      c. Whirlpool Corp: www.whirlpool.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Wall Oven, EQ-11: Electric, single oven.
   1. Width: 24 inches.
   2. Height: 23 1/2 inches.
   3. Oven: Self-cleaning with electronic ignition.
   4. Controls: Solid state electronic.
   5. Features: Include oven door window, broiler pan and grid, and oven light.
   6. Exterior Finish: Porcelain enameled steel, color as indicated.
   7. Basis-of-Design: JennAir, JJW2424HL.
   8. Manufacturers:
      a. Frigidaire Home Products: www.frigidaire.com/#sle.
      b. GE Appliances: www.geappliances.com/#sle.
      c. Whirlpool Corp: www.whirlpool.com/#sle.
      d. Sharp: www.shop.sharpusa.com.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

E. Microwave, EQ-10: Over-the-range.
   1. Quantity: 1
   2. Location: Vocational Independent Living Classroom - 165
   3. Capacity: 1.7 cubic ft.
   4. Power: 1,000 watts.
   5. Features: Include turntable, digital display with clock.
   6. Exterior Finish: Stainless Steel.
   7. Basis-of-Design: GE, JVM3160RFSS.
   8. Manufacturers:
      a. Frigidaire Home Products: www.frigidaire.com/#sle.
      b. GE Appliances: www.geappliances.com/#sle.
      c. Whirlpool Corp: www.whirlpool.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

F. Microwave, EQ-7: Countertop.
   1. Capacity: 1.5 cubic ft.
   2. Power: 1,100 watts.
   3. Features: Include turntable, digital display with clock.
   4. Exterior Finish: Stainless Steel.
   5. Basis-of-Design: GE, JES2051SNSS.
   6. Manufacturers:
      a. Frigidaire Home Products: www.frigidaire.com/#sle.
      b. GE Appliances: www.geappliances.com/#sle.
      c. Whirlpool Corp: www.whirlpool.com/#sle.

d. Substitutions: See Section 01 60 00 - Product Requirements.

G. Dishwasher, EQ-8: Undercounter.
1. Controls: Solid state electronic.
2. Wash Levels: Three (3).
3. Features: Include rinse aid dispenser, optional water temperature boost, adjustable upper rack, and adjustable lower rack.
4. Finish: Stainless steel, color as indicated.
5. Basis-of-Design: GE, JTS3000SNSS.
6. Manufacturers:
a. Frigidaire Home Products: www.frigidaire.com/#sle.
b. GE Appliances: www.geappliances.com/#sle.
c. Whirlpool Corp: www.whirlpool.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LAUNDRY APPLIANCES

A. Clothes Washer, EQ-5: Front-loading.
1. Size: Large capacity.
2. Controls: Solid state electronic.
3. Finish: Painted steel, color white.
4. Basis of Design: WFW560CHW by Whirlpool.
5. Manufacturers:
a. Frigidaire Home Products: www.frigidaire.com/#sle.
b. GE Appliances: www.geappliances.com/#sle.
c. Maytag Commercial: www.maytagcommerciallaundry.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Clothes Dryer, EQ-6: Electric, Front-loading.
1. Size: Large capacity.
2. Controls: Solid state electronic, with electronic moisture-sensing dry control.
3. Temperature Selections: One.
4. Cycles: Include normal, permanent press, knit/delicate, and air only.
5. Features: Include interior light, reversible door, stationary rack, sound insulation, and end of cycle signal.
6. Finish: Painted steel, color as indicated.
7. Basis of Design: WED560LHW by Whirlpool.
8. Manufacturers:
a. Frigidaire Home Products: www.frigidaire.com/#sle.
b. GE Appliances: www.geappliances.com/#sle.
c. Maytag Commercial: www.maytagcommerciallaundry.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORIES

A. Dryer Vent Assembly: Comply with ICC (IMC)-2021 and ICC (IRC)-2021.
1. Exhaust Duct: Aluminum ribbon, 4-inch diameter, comply with UL 2158A.
a. Elbows: 26-gauge, 0.018-inch aluminized steel; 45 degree angle, non-sectioned curve; 4-inch diameter.
b. Clamps: Stainless steel, 3-1/2 to 4-3/4-inch diameter range.
2. Wall Termination: 26-gauge, 0.018-inch aluminized steel with rain drip edge, rubber magnetic bumpers, angled damper, and removable backing plate; 6-1/2 inches wide by 6.45 inches tall.
3. Pest Protection Gate: 26-gauge, 0.018-inch zinc-coated steel, vertical bar gate, manufacturer's recommended size to fit termination.
4. Recessed Dryer Hose Receptacle: 22-gauge, 0.0299-inch aluminized steel receptacle recessed within partition, 12-1/2 inches wide by 21 inches tall, 3-1/2 inches deep, upward exhaust direction.

5. Label: Where exhaust duct length exceeds 35 feet, provide label or tag identifying duct length. Locate label or tag within 6 feet of duct connection.
6. Finish for Exposed Metals: Black powder coat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor built-in equipment in place.

3.03 ADJUSTING

A. Adjust equipment to provide efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment and properly discard.

B. Wash and clean equipment.

END OF SECTION

SECTION 11 40 00
FOODSERVICE QUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 01 Sections, apply to this Section.

1.2 SCOPE

A. Attention is directed to the detailed Item Specifications, which provide for minimum acceptable products. Item Specifications paragraphs may indicate materials or components that exceed the manufacturer's standards and are required for this project.

B. Cooperate and coordinate with others engaged on the project in order that work will progress on schedule.

C. Work to be performed under this Section is shown on Foodservice Equipment Drawings.

D. Install materials furnished under this Section, other than materials that are expressly noted for installation under other Sections. Installation work shall be performed by workmen compatible with those existent on the project site. Equipment shall be of the latest design; new and unused, unless indicated otherwise in the Item Specifications, complete with all standard parts for normal operations and including such accessories or materials as may be required to comply with these Specifications.

E. This Specification is to further describe and supplement the applicable Drawings. What is called for by either the Drawings and/or these Specifications shall be furnished and installed as part of this work. Any questions relative to discrepancies or omissions shall be submitted to the Architect.

F. Provide neatly punched openings or cutouts required to permit passage of plumbing and electrical services by related trades and to accommodate mounted switches and receptacles in the equipment.

1. Work in this Section shall include but shall not be limited to the following:
2. Catalog items of equipment.
3. Fabricated equipment other than catalog items.
4. Plumbing trim consisting of mechanical system components required for standard operation of equipment items such as faucets and waste outlets. Vacuum breakers shall be furnished for equipment where water is introduced less than 2 in. above flood level.
5. Electrical equipment forming an integral part of equipment items such as electric motors, heating elements, controls, switches, starters, temperature regulators and internal wiring to a control panel or switch, if mounted on the equipment.

G. Sustainable Design Intent: Comply with project requirements intended to achieve a

rating, measured and documented according to the LEED Green Building Rating System, of the US Green Building Council.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Finished floor and walls, structural supports for all ceiling supported equipment, acoustical ceilings and related building.

B. Connecting piping, waste lines, traps and vent piping, complete with shut-off valves to all the equipment, and the rough-in for sanitary waste, domestic water, floor drains and plumbing fixtures except those provided under this Section, and related mechanical work.

C. Exhaust ventilating systems complete with blowers, ductwork, hangers, access panels, and insulation between the exhaust collars and the exhaust blowers.

D. External wiring; the mounting and wiring of motor starters, solenoid valves, switches and receptacles not integral with the equipment; mounting and wiring of walk-in refrigerated room ceiling mount light fixtures; wiring of walk-in refrigerated room interior evaporator coils; connecting conduit, and external connections to equipment to the building electrical distribution system.

1.4 SUBMITTALS

A. Submit Shop Drawings for approval in accordance with the General Conditions.

B. Stub-in drawings shall indicate the layout of equipment and dimensioned locations of all services to the equipment.

1. Hand drawn scale: 1/2 inch = 1’-0”.
2. CAD drawn scale: 1/4 inch = 1’-0”.
3. Stubbed services shall include electrical, hot and cold water, floor drains or floor sinks, solid wastes and exhaust collar connections. Point of connection services shall include steam supply, condensate return, gas connection and indirect waste connections. Service dimensions shall include height measured from finish floor.
4. Electrical and plumbing services shall be indicated and coordinated on the same drawing.
5. Call-outs for each stub point indicated at the point, or clearly keyed to a schedule on the same drawing.
6. Special conditions plan shall include all floor recesses, curbs and special wall construction indicated and dimensioned

C. Fabrication drawings shall be furnished for non-catalog items, showing plans, elevations and full construction details with gauges, components, fasteners, erection and connections. Drawings shall be to the minimum scale of 3/4 in. = 1 ft., 0 in.

D. Standard items of equipment, not built-in or part of other assemblies shall be submitted for approval in the form of bound catalog cuts. Each cut shall include a clearly marked item number, a listing of all optional accessories and finishes, and connection data.

E. Mechanical refrigeration system submittal shall include the firm name and address of the installation contractor and name of the qualified installer.

F. Energy Star - Specified Energy Star rated equipment and appliances shall serve as the standard for all types of equipment and appliances whenever possible. Kitchen Equipment Contractor shall clearly indicate that items are Energy Star rated both on the submittal cover sheet and manufacturer cut sheets.

G. Failure to comply with approved shop drawings shall be cause for rejection of an improperly built assembly.

1.5 SAMPLES

A. If the bidder's proposed equipment fabricator is unknown to the Consultant's office, immediately after award of contract, submit the following samples for selection and approval:

1. Section of table showing edge, bullnose, framing, fasteners, gusset, leg, and foot, all assembled.
2. Drawer assembly (will be returned for use on this project).

B. Work delivered to the job shall match approved samples.

1.6 GUARANTEES AND WARRANTIES

A. New equipment furnished for this facility shall be guaranteed for a period of not less than one calendar year beginning on the date of final acceptance of the work of this Section. In the case of a manufacturer whose standard warranty exceeds this period the longer period shall apply. Self-contained refrigeration units for reach-in refrigerators, freezers, ice cream chests and ice machines shall carry a five-year replacement warranty for the sealed unit. The guarantee shall protect against defective material, design and workmanship.

B. In addition to the guarantee called for under the General Conditions, this Contractor shall further agree that in the event of failure of any system or item of equipment or improper functioning of specified work during the guarantee period, he shall have "on call" competent service personnel available to make the necessary repairs or replacements of specified work promptly at no cost to the Owner. In the event that replacement of an entire item is required, the Owner will have the option of full use of the defective equipment until a replacement has been delivered and completely installed.

C. Furnish manufacturer's warranty for each item of standard equipment and a warranty on fabricated equipment. Submit guarantees and warranties to the Architect in accordance with conditions found in "Demonstration and Operating Instructions" paragraphs, contained in Part 3, this Section.

1.7 REGULATORY AGENCIES

A. Work shall be in accordance with the governing health, building and safety, and fire protection codes and regulations.

B. Standards of the National Sanitation Foundation (NSF) shall serve as guidelines for the work of this Section.

C. Electric equipment and accessories shall conform to the standards of the National Electric Manufacturers Association (NEMA), Underwriters Laboratories, Inc. (UL) or

Electrical Testing Station (ETS).

D. Steam generating equipment and accessories shall conform to the standards of the American Society of Mechanical Engineers (ASME).

E. Gas fired equipment and accessories shall conform to the standards of the American Gas Association (AGA) and the American National Standards Institute (ANSI) Z83.11.

F. Energy Star - Specified Energy Star rated equipment and appliances shall serve as the standard for all types of equipment and appliances whenever possible.

1.8 EQUALITY OF MATERIALS AND EQUIPMENT

A. The base bid shall contain no substitutions to these drawings or specifications. Bidders may offer substitute equipment in a separate proposal, indicating the proposed model and sum to be added or deducted if the alternate item is accepted by the Owner. Each line item shall include delivery, installation and taxes. Decisions to accept or reject a piece of equipment shall be made by the Owner, and all decisions shall be final.

PART 2 - PRODUCTS

2.1 MATERIALS AND FINISHES

A. General

1. Metals shall be free from defects impairing strength, durability or appearance, made of new materials with structural properties to withstand strains and stresses to which normally subject.
2. Stock materials, patterns, products and methods of fabrication shall be approved provided that they conform to the requirements specified under Item Specifications.

B. Stainless Steel

1. Stainless steel shall be non-magnetic corrosion resistant chromium-nickel steel, Type 302 or 304 (18-8 Alloy), polished to a Number 4 finish where exposed, unless otherwise noted. Minimum gauges shall be as specified under Item Specifications.

C. Galvanized (Galvannealed) Steel

1. Galvannealed steel shall be commercial quality with tight coat of zinc galvanizing metal applied to a soft steel sheet, subsequently passed through a 1200 degree F. oven, resulting in a spangle free paintable surface. Minimum gauges shall be as specified under Item Specifications.

D. Plastic Laminate Materials

1. The laminate facing shall be GP-50, .050 in. thick, general purpose, high pressure, decorative plastic laminate that meets or exceeds the requirements of NEMA Publication LD3-1985, and NSF Standard 35. The plastic laminate exposed surfaces shall be provided in accordance with the specified manufacturer, finish and color. Balancing sheet shall be backing

grade GP-28 in matching color at semi-exposed and BK-20 unfinished where hidden.

2. Plastic laminate covered surfaces shall be factory fabricated with 3/4 in. thick core having plastic laminate facing on both faces and all edges, laminated with waterproof glue under pressure in accordance with the plastic laminate manufacturer's specifications.
3. The core shall be medium density phenolic resin particleboard conforming to ANSI A208.1, Type 2-M-2, 45 pound per cubic foot density minimum.
4. Provide veneer core plywood or solid hardwood edge banding for doors and vertical dividers or panels where hardware is attached to casework.
5. Hinges shall be articulated, spring loaded type equal to Grass CST65-170-F or Stanley, with quantity adequate to support the door without deformation. Do not provide handles on plastic laminate clad doors.

2.2 CONSTRUCTION

A. General

1. Flat metal work items of equipment, such as tables, sinks, or counter tops, and other non-catalog items described under Item Specifications, shall be manufactured by a food service equipment fabricator who has the plant, personnel and engineering facilities to properly design, detail and manufacture high quality food service equipment.
2. The equipment fabricator shall be subject to the approval of the Architect, Owner and Consultant. Refer to Paragraph 1.05, Samples.
3. Fabricated foodservice equipment shall be manufactured by one manufacturer, of uniform design, material and finish.
4. Equipment shall conform to the applicable requirements of current Federal, State, and Local Codes and Regulations.

B. Welding

1. The words "weld", "welded" or "welding" as used in this Section of the Specification shall mean that metal joints shall be continuously welded and the exposed parts ground smooth and polished to match adjoining surfaces. Welding electrodes shall match the material being welded.
2. Where spot welding is specified, the welds shall be a maximum spacing of 3 in. on center.
3. Where tack welding is specified, the pieces welded shall have 1/2 in. minimum lengths of welding material at 4 in. on center maximum spacing.

C. Grinding, Polishing and Finishing

1. Exposed welding joints shall be ground flush with the adjoining material and neatly finished to harmonize therewith. Wherever material has been depressed or sunken by a welding operation, such depressions shall be suitably hammered and peened flush with the adjoining surfaces and, if necessary, again welded and ground to eliminate low spots. Ground surfaces shall be polished or buffed to a degree consistent with good workmanship. Coves shall be ground and polished to match adjoining material.
2. Care shall be exercised in grinding operations to avoid excessive heating of metal and discoloration. Abrasives, wheels, and belts used in grinding stainless steel shall be iron free and shall have not been used on carbon

steel. The texture of the final polishing operation shall be uniform and smooth. Grain direction shall be uniform, uni- directional for a total length of material. Cross grains and random polishing are not acceptable.

3. The general finish of equipment shall be consistent throughout the job. Brake ends shall be free of open texture or orange peel appearance, and where brake work mars the uniform finish of the material, the marks shall be removed by grinding and polishing, and finishing. Sheared edges shall be free of burrs, projections or fins to eliminate all danger of laceration. Mitered or bullnosed corners shall be neatly finished with the underedge of the material neatly ground to a uniform condition and in no case will overlapping material be acceptable. The equipment surfaces, where exposed, shall be finished to a grained Number 4 (satin) finish unless otherwise specified. An exposed surface shall include an inside surface, which is exposed to view when a swinging or sliding door is opened. Underside of shelves need not be satin finish unless otherwise specified.
4. Excessive distortion caused by welding shall be cause for rejection for that item of equipment.

2.3 BUY-OUT COMPONENTS

A. CASTERS: 5 in. diameter polyurethane tired, swivel, plate or stem mount to suit application, 300 pound capacity, brakes only if specified, NSF approved; Component Hardware C-21-3050 (plate/no brake), C21-3051 (plate/brake) C23-3350 (stem/no brake) or C23-3351 (stem/brake), or equal by Kason, or PDI Atlanta.

B. COUNTER LEGS: Stainless steel, 6 in. to 7-3/4 in. height adjustment; Component Hardware A72-0811, or A77-5048, or equal by Kason, or PDI Atlanta.

C. DOOR AND DRAWER PULLS: Stainless steel, full grip type with beveled edge, NSF approved for stud mounting in device, in horizontal attitude to meet NSF requirements; Component Hardware P63-1012, or equal by Kason, or PDI Atlanta.

D. DOOR HINGES: Stainless steel, lift off type, swedged knuckle for minimum clearance, nylon bearings; Component Hardware M75-1002 or equal by Kason, or PDI Atlanta.

E. DRAWER PANS: Molded plastic or fiberglass, 20 in. by 20 in. by 5 in. deep, NSF approved; Component Hardware S80-2020, or equal by Kason, or PDI Atlanta.

F. DRAWER SLIDES: Stainless steel, NSF approved, full extension, 200 pound capacity with stainless steel ball bearing wheels; Component Hardware S-52 series, or equal by Kason, or PDI Atlanta.

G. FAUCET SETS, DECK MOUNTED: Chrome plated cast bronze with 1/2 in. IPS eccentric flanged female inlets on 8 in. centers, removable cartridges, lever handles, and aerator tip on swivel nozzle or swivel gooseneck to suit the application; T&S Brass B-0221 (with B- 0425-M connection kit) or B-0321-NPL, or equal by Component Hardware, Chicago, or Fisher.

H. FAUCET SETS, POTWASHING SINK: Chrome plated cast bronze with removable cartridges, 3/4 in. passages, eccentric flanged female inlets on 8 in. centers with LL street EL inlets with locknuts, four prong handles, 12 in. swing

spout; T&S Brass B-0290 or equal by Component Hardware, Chicago, or Fisher.

I. FAUCET SETS, SPLASH MOUNTED: Chrome plated cast bronze with 1/2 in. IPS eccentric flanged female inlets on 8 in. centers, removable cartridges, lever handles, and aerator tip on 12 in. swing spout; T&S Brass, B-0231-CC or equal by Component Hardware, Chicago, or Fisher. Provide each with a mounting kit.

J. GUSSETS: Stainless steel, stepped side, fully closed, NSF approved, mild steel interior reinforcement, wide flange for welding to framing, set screw anchor for leg; Component Hardware A20-0206C, or equal by Kason, or PDI Atlanta.

K. LEG AND BULLET FOOT ASSEMBLIES: Stainless steel tubing, 16 gauge, number 4 finish, adjustable bullet foot with minimum of 3 in. vertical travel, 2,000 pound capacity, top designed for mounting in gusset, length to suit application; Component Hardware A46- 6272-C, or equal by Kason, or PDI Atlanta.

L. LEG AND FLANGED FOOT ASSEMBLIES: Stainless steel tubing, 16 gauge, number 4 finish, adjustable bullet foot with 3-1/2 in. diameter flange and two holes for securing to floor, minimum of 3 in. vertical travel, 2,000 pound capacity, top designed for mounting in gusset, length to suit application; Component Hardware A46-4272-C, or equal by Kason, or PDI Atlanta.

M. NUTS: Zinc plated "Pal Nuts" with integral cap and lockwasher; Component Hardware Q- 34-1024 or equal by Kason, or PDI Atlanta.

N. SEALANT: Sealant for sealing equipment to walls or filling crevices between components. All materials listed below that are used in the building interior must not exceed the following requirements:

1. South Coast Air Quality Management District (SCAQMD) Rule #1168
2. For interior adhesives and sealants applied within the weatherproof barrier, submit a printed statement of VOC content.

O. SOUND DEADENING BASINS: Component Hardware Q75-1366 or equal by Kason, or PDI Atlanta.

P. SOUND DEADENING TOPS AND SHELVES: Component Hardware Q85-5225, or equal by Kason, or PDI Atlanta, "Tacky Tape" installed between all channel or angle reinforced tops, drainboards or undershelves.

Q. WASTE OUTLETS, CRUMB CUP: Stainless steel body, removable crumb cup stopper, gasket, coupling nut and sealing washer, 1-1/2 in. IPS, and optional 4 in. long nickel plated brass tailpiece with gasket; Component Hardware E38-1010, or equal by Kason, or PDI Atlanta.

R. WASTE OUTLETS, LEVER OPERATED: Cast stainless steel rotary type with 1-1/2 in. NPS and 2 in. NPS threads, and removable beehive crumb-cup; Component Hardware DSS-8000 or equal by Component Hardware, Chicago, or Fisher.

S. WELD STUDS: Copper flashed steel with 10-24 threads, length to suit; Component Hardware Q-36, or equal by Kason, or PDI Atlanta.

T. GFCI RECEPTACLES: Pass & Seymour 2095-W, 115 volt, 20 amp GFCI Duplex Receptacle or equal.

2.4 FABRICATED COMPONENTS

A. Box Type Cabinet Construction

1. Sheet metal cabinet bases of box type construction shall be fabricated without general interior framing. Structural strength shall be achieved by the gauge of the metal and the formed angle and channel edges and corners. Vertical sections shall be closed. Cabinet base shall be fabricated of 18 gauge minimum of material specified at Item Specifications. Mount on counter legs or base as specified.
2. Intermediate shelf shall be fabricated of 16 gauge stainless steel with rear and sides turned up 1-1/2 in. tight to the cabinet sides. The front edge of shelf shall be turned down 1-1/2 in. and in 1/2 in. at 45 degrees and shelf spot welded in place. Reinforce underside with longitudinal 14 gauge channel on the centerline.
3. Bottom shelf shall be fabricated of 16 gauge stainless steel similar to the intermediate shelf except that the front edge shall be formed into a full width 1-1/2 in. by 4 in. welded in boxed channel. Rear edge shall be fitted with a full width channel. Underside shall be reinforced.

B. Counters and Drainboards

1. Counters, table tops and drainboards shall be 14 gauge stainless steel, of NSF construction, with edges per Item Specifications. Metal tops shall be made of the largest pieces available and shall appear as one piece with all field and shop joints reinforced and welded, ground and polished. Short pieces of metal will not be acceptable. Counter bends shall be not less than 1/8 in. radius. Wherever a fixture has a waste or drain outlet, the surface shall pitch toward the outlet.
2. Counters, table tops and drainboards shall be reinforced with channel or angle frame as specified in the Item Specifications. Framing shall be secured to the underside with sound deadening material sandwiched between the surfaces, weld studs, and nuts.
3. Wherever bolts or screws are welded to the underside of trim or tops, neatly finish the reverse side of the weld uniform with the adjoining surface of the trim or top. Depressions at these points will not be acceptable. Raise dimples and depressions by peening, or heating and shrinking, and grind and polish to present a flat surface.

C. Crossrails

1. Crossrails shall be not less than 1-1/4 in. outside diameter 16 gauge stainless steel tubing welded, ground and polished to a Number 4 finish. Crossrails shall be welded to legs at a height of 10 in. above finished floor, and shall extend from left to right between front legs, unless otherwise specified, and from front to back between all legs.

D. Drawer Assembly

1. Drawer assemblies shall consist of a removable drawer pan set in a removable 16 gauge stainless steel channel shaped drawer support frame with gusset plate reinforced corners.
2. Support frame shall have double pan front cover consisting of boxed 18 gauge stainless steel outer shell with welded corners, flush mounted recessed stainless steel pull, 20 gauge stainless steel back shell tack welded to outer

shell with fiberglass sound deadening between. Drawer shall be provided with rubber bumpers to quiet closing. Support drawer frame on full extension drawer slides.

3. Drawer shall be suspended from table in a three-sided, 16 gauge stainless steel enclosure with flanged-in bottom edges, banded lower front, flanged-out front side and top edges. All sharp corners shall be broken and any exposed exterior threads of slide mounting bolts shall be provided with solid metal acorn nuts.
4. Component Hardware S91-0020 with thermoplastic pan is considered as equivalent to the above specified construction.

E. Edges

1. Marine: Bumped up 1/2 in. at 45 degrees and turned down 1-1/2 in. and in 1/2 in. at 45 degrees; corners welded and square.
2. Raised roll: Coved up and rolled 180 degrees on a 1-1/2 in. diameter with 3 in. height; corners welded and rounded or coved.
3. Rolled: Rolled 180 degrees on a 1-1/2 in. diameter; corners welded and bullnosed.
4. Short (6 inch) splash on counters and tables: Coved up 6 in., turned back to wall or equipment 1 in. and down 1/2 in.; ends welded closed. Secure tight to face of wall with clips unless specified otherwise and seal joint.
5. Tall (10 inch) splash on preparation sinks, dishtables, counter, and tables: Coved up 8-1/2 in., turned back to wall or equipment 1-1/2 in. at 45 degrees and down 1/2 in.; ends welded closed. Secure 3 in. off face of wall with brackets unless specified otherwise.
6. Turn down: Turn down 2 in. and in 1/2 in. at 45 degrees; corners welded and square.

F. Framing of Tops, Drainboards, Undershelves

1. Channel: Reinforce with 1 in. by 4 in. by 1 in. 14 gauge galvannealed steel channels; stainless steel if exposed to view. Channels shall run front-to-back at all legs and longitudinally on the centerline. Cross and longitudinal members shall be welded into a single assembly at intersections and sharp corners shall be broken. Framing shall be secured to underside of tops with pairs of weld studs. Framing shall be installed

   maintaining NSF required clearance to adjacent vertical surfaces and edges of top. The following specified angle framing is considered superior to channel framing and may be used in its place.
2. Angle: 1-1/2 in. by 1-1/2 in. by 1/8 in. perimeter angle frame with crossmembers not over 30 in. on center. Framing shall be secured to top with weld studs, 18 in. on center maximum with three minimum studs on any single face of a table. Perimeter angle frame that is exposed to normal view, shall be stainless steel. Crossmembers and framing not unexposed to normal view shall be iron. Corners of angle frame shall be mitered, or notched and brake formed to form a closed corner. Corner gusset plates used for mounting of leg gussets shall be 1/8 in. thick and sealed to underside of the top. Iron framework joints shall be ground smooth, and shall be painted with a minimum of two coats of aluminum lacquer after degreasing. Framing shall be installed maintaining NSF required clearance to adjacent vertical surfaces and edges of top. Channel framing shall not be considered equal to specified angle framing.

3. Sound deaden all horizontal framed surfaces with material sandwiched between the framing and the bottom of the surface.

G. Hinged Doors

1. Hinged doors shall be double pan type stainless steel construction with 18 gauge exterior and 20 gauge interior, welded corners, and 1/2 in. fiberglass insulation for sound deadening. Each door shall be provided with a stainless steel recessed handle, and an adjustable tension door catch equal to Component Hardware M22-2430. Doors shall close against the bottom shelf and flush with body of equipment.
2. Louvered hinged doors for ventilation shall be fabricated of the same components and provided with a full perimeter 3 in. wide channel reinforcing frame on the interior face. Remaining face shall be die punched with drip-proof louvers fully utilizing the remaining flat metal or a stainless steel flattened expanded metal grille per Item Specifications.

H. Sinks and Sink Inserts

1. Unless otherwise specified, sinks including sink inserts built into tops of fixtures, shall be made of 14 gauge stainless steel with all vertical and horizontal corners rounded to a radius of approximately 3/4 in. with the intersections meeting in a spherical section. Sinks shall be integrally welded to fixture tops.
2. Sinks with two or more compartments shall have full height, 1 in. thick double wall partitions consisting of two pieces of stainless steel back-to-back so fabricated that each compartment will be a deep bowl with coved corners. Partitions shall be welded in place to the bottom, front and back of the sink with smooth rounded coved corners. Top edges of the partitions shall be continuously welded. The front of the sinks shall consist of a stainless steel smooth, flush apron, same gauge as the sinks. Bottom and rear of partitions shall be closed. Sink dimensions contained in Item Specifications are inside dimensions.
3. Sinks shall be provided with integral 14 gauge stainless steel drainboards when specified. Drainboards and sink basins shall be pitched toward waste outlets and shall be self draining. The underside of all sink basins shall sound deadened. Sink units shall be provided with an integral splash at walls. Provide the necessary holes for the mounting of faucet sets.

I. Sliding Doors

1. Sliding doors shall be double pan type stainless steel construction with 18 gauge exterior and 20 gauge interior, welded corners, and 1/2 in. fiberglass insulation for sound deadening. Each door shall be provided with a stainless steel recessed handle. Provide sliding doors with nylon roller bearing sheaves and overhead track

components equal to Component Hardware B58-5523 and 5513 sheaves, B57 track, B62-1093 nylon door guides and B60-1086 door stops.

J. Undershelves

1. Undershelf in an open type table shall be 16 gauge stainless steel unless otherwise noted. Edges shall be turned down 1-1/2 in. and in 1/2 in. at 45 degrees with corners notched out to fit legs to which shelf shall be welded from underside. Line up all edges of shelf with centerline of legs. Reinforce underside with longitudinal 14 gauge channel on the centerline.

K. Wall Brackets

1. Dish tables, sinks and counters with sinks shall be securely anchored 3 in. off the face of the wall unless specified otherwise. Brackets shall be "Z" shaped and fabricated of 3 in. wide, 14 gauge stainless steel. Brackets shall be secured in a vertical attitude to the rear of equipment backsplash with weld studs, and to the wall with appropriate fasteners.
2. Counters that are specified tight-to-wall shall be secured in a hidden manner with steel clips, and the wall/fixture joint shall be sealed.

L. Wall Shelves

1. Wall shelves shall be fabricated of 16 gauge stainless steel, size per Item Specifications, with back and ends raised 1-1/2 in., front edges of ends angled back, all corners broken, and front turned down 1-1/2 in., and in 1/2 in. at 45 degrees. Shelf corners shall be welded, ground and polished. Mount shelf 1 in. off face of wall with suitable fasteners on 14 gauge stainless steel flag brackets, 48 in. on center maximum. Flag brackets shall have a web angle of 30 degrees, measured from horizontal.

2.5 ELECTRICAL EQUIPMENT AND WIRING

A. Under this Section, items of equipment having mounted electrical motors, electrical heating units, lighting fixtures, controllers, control stations, switches, receptacles and the like shall be internally wired as specified herein, terminating at a junction box mounted on the equipment and left ready for connection to the building electrical distribution system by the Electrical Contractor. Extra ceiling mount light fixtures for refrigerated rooms shall be delivered to Electrical Contractor for field installation and wiring. Connections to evaporator coils mounted inside refrigerated rooms shall be wired by the Electrical Contractor.

B. Provide openings or cutouts required to accommodate the switches and receptacles in the specified work, and the wiring in conduit from terminal blocks in junction boxes.

C. Electrically operated equipment and fabricator wiring shall conform to the requirements of Underwriter's Laboratories, Inc. Motors over one horsepower shall be equipped with overload protection.

D. Furnish wiring diagrams for equipment as requested by the Architect or Contractor.

2.6 ITEM SPECIFICATIONS (Listed on following pages)

Item 1

MOP SINK & SERVICE FAUCET

No work in this Section. Item to be provided and installed by Plumbing Contractor.

Item 2

MOP RACK/SHELF

Make- Advance Tabco K-245*C166 or equal by Eagle or

Aero Size- 24" x 8" x 7-1/2" high

Description - Unit shall be all standard construction of welded 18 gauge stainless steel type 430 polished satin finish, back and sides turned up 1-1/2", mounted on two die formed wall brackets and furnished with three mop hangers and four rag hooks.

Item 3

DETERGENT STORAGE CABINET

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 30 in. by 18 in. by 72 in. high

Construction - 16 gauge stainless steel sloped top at 104 degrees with edges turned down, 18 gauge stainless steel cabinet body, fixed bottom shelf, three adjustable intermediate shelves, and 63 in. high double pan hinged doors at front. Mount on 6 in. high stainless steel adjustable legs.
Secure unit to wall and seal as required.

Accessories - Provide unit with two (2) three point "T" handles, one locking and barrel bolts mounted to inside top and bottom of door. Provide slotted "L" bracket a top rear for securing to wall.

Item 4

STAFF LOCKER

Quantity - 3

No work in this Section. Item to be provided and installed by General Contractor.

Item 5

STACKED CLOTHES WASHER/DRYER

Make - UniMac UTEE5ASP175TW01 or equal Wascomat or

Speed Queen Size - 27" x 27-3/4" x 78-3/16" high

Power - 30 amps circuit - 120/240/60/1 - cord and plug (NEMA

14-30P) 20 amps circuit - 120/60/1 - cord and plug (NEMA 5-

15P)

Exhaust - 4" diameter dryer vent

Maximum Water Use - Less than 3.7 gallons/ft3/cycle

Certification - Unit shall be Energy Star certified or performance equivalent.

Description - Washer shall be all standard construction with white exterior, see-thru door with heavy duty stainless steel hinge, 3.42 cubic foot front loading basket, detergent dispensers, front panel control, three wash/rinse temperatures, and five selectable wash cycles. Dryer shall be all standard construction with white exterior, see-thru door with heavy duty stainless steel hinge, lint filter, and interior light.

Item 6

MILK COOLER

Make - True TMC-58-S-SS-HC or equal by Beverage Air

Size - 58" x 33" x 46-3/4" high; sixteen 13" x 13" x 11" milk crate

capacity Power - 2.7 amps - 120/60/1 - cord and plug

Description - Milk cooler shall be all standard construction with stainless interior and exterior. Self- contained refrigeration system with thermostatic controls, R290 refrigerant, polyurethane foam insulation, and hinged stainless steel removable service doors. Unit provided with digital exterior temperature display. Mount on 4" diameter swivel casters.

Item 7

STORAGE SHELVING, FIVE-TIER

Quantity - 6

Make - Metro Super Adjustable Super Erecta or equal by ISS or Cambro

Size - (1) 54" x 21", (2) 48" x 21", (2) 42" x 21", and (1) 36" x 21", all 74-5/8" high; five tier with bottom shelf up 14" clear above floor

Description - Unit shall be all standard construction with Super Adjustable Chrome plated wire shelves and tubular steel uprights with capped tops, adjustable feet, and 1" shelf height adjustment capability with Corner Release System. Each unit shall include four legs.

Item 8

WALK-IN COOLER

Make - American Panel or equal by Bally, or Thermo-Kool

Size - 7'-2-1/2" x 7'-9" x 7'-10" high minimum inside dimensions; 7'-8" high after finished floor is installed by the General Contractor

Power - 1.1 KW - 120/60/1 to light fixtures, temperature monitor/alarm, and door defrost heater strip Installation, Construction, Materials and Accessories - See Item 9

Guarantee - See Item 9

Item 9

WALK-IN FREEZER

Make - American Panel or equal by Bally, or Thermo-Kool

Size - 6'-3" x 7'-9" x 7'-10" high minimum inside dimensions; 7'-8" high after finished floor is installed by the General Contractor.

Power - 1.3 KW - 120/60/1 to light fixtures, temperature monitor/alarm, door defrost heater strip, and pressure relief port

Installation - The walk-in refrigerated room assembly shall be installed in a 7" deep ID recess (below finished floor). Recess depth allows 1" for use of leveling sand; 4" for the insulated floor panels; 2" for finished floor and setting bed that shall be carried in from the adjacent room and level to same. The finished floor and setting bed shall be furnished and installed by the General Contractor, and shall have coved joints at all interior and exposed exterior walls, turned up a minimum of 4" inside and out. The assembly shall be set level on a bed of clean, dry mason's sand. Shims are not acceptable for leveling material.

Construction - All standard construction per the manufacturer, modified to meet the specific following points:

- Walls to be 4" thick with CFC free urethane foam insulation, UL Class 1 rated
- Cam type locking devices

- 34" x 76" minimum door clearance
- Polished hardware (hinges and latch to match)
- Three hinges on doors (to include one Kason 1248 spring assist hinge per door)

- Leveraged pull handle (mechanical advantage type, Kason 1236 or equal)
- Quarter turn inside safety release lever handle mechanism (not screw type)
- Prewired door sections with heater wires and light fixtures and switches
- Kason 1806 LED light fixtures or Kason 1808 LED light fixtures
- Dial type thermometers at doors
- Model IC+ (with dry contacts) temperature and HACCP monitoring system at doors. Cooler and freezer alarms to interconnect with access control system for alert monitoring. This Contractor to provide each system with a pair of 22 gauge low voltage wires. Wires shall be installed by the Controls Contractor. Wires shall run from the dry contacts to the access control panel. This Contractor to verify length prior to purchasing. To avoid false triggering, provide a shielded two- conductor cable with the shield connected to the receiving equipment.
- NSF construction throughout with exception of buried floor panels
- Interior and exterior faces of doors and exposed exterior walls shall be provided with aluminum diamond tread plate protective material to a height of 48" above finished floor. Hold diamond plating up 6" from the finish floor to accommodate the coved base.

Minimum Cooler Insulation R-Values

Wall and Roof Panels (4 in.):

R-29 Floors: R-25

Doors: R-32

Minimum Freezer Insulation R-

Values Wall and Roof Panels

(4 in.): R-32 Floors: R-28

Doors: R-32

Minimum materials - Interior and exterior wall surfaces shall be clad with .038" pebble finished aluminum. The ceiling shall be finished in white polyester over 24 gauge galvanized steel. Interior floor shall be 14 gauge galvanized steel.

Accessories - Freezer shall be provided with an electrically heated pressure relief port. Each door shall be provided with a heated vision panel, 14-1/2" x 23" constructed of three panels of tempered unbreakable glass, electrically heated, with sealed air spaces between. Provide matching trim strips and closure panels to adjoining surfaces, fabricated per details, made of largest pieces available to minimize number of joints, and installed in accordance with NSF Brochure 770202, Installation Manual for Walk-in Refrigerators and Freezers. Provide four total extra Kason 1806 LED OR Kason 1808 OR 1810LCT400 LED light fixtures for mounting in the rooms and deliver to Electrical Contractor for field installation.

Guarantee - The walk-in refrigerated room panels shall be guaranteed for a period of ten (10) years from the date of approved installation for defects in materials and workmanship when subjected to normal use and service; remainder of rooms for one year.

Item 10

MECHANICAL REFRIGERATION SYSTEMS

Quantity - 2

Make - Heatcraft, Bohn, Larkin, Climate Control, Chandler

Scope - Furnish and install complete refrigeration systems for the walk-in refrigerated rooms in accordance with the plans. The systems shall include condensing units, evaporator coils, piping, all specified accessories, and those components required to provide

complete and satisfactory systems in accordance with accepted refrigeration practice.

Important: The installation work shall be performed by a fully qualified refrigeration contractor employing a certified mechanic fully trained in the installation of commercial refrigeration systems.
Submittal shall list the installing company and the qualified system installer.

Piping - Furnish and install the interconnecting piping between the condensing units and their respective unit coolers. Piping shall be installed in a neat and workmanlike manner with adjustable hangers spaced at no more than ten foot intervals on horizontal runs; six foot intervals, vertical runs.

Line sizes shall be in accordance with ASHRAE standards and best refrigeration practice to assure proper feed to evaporator, avoid excessive pressure drop, and prevent excessive amounts of lubricating oil from being trapped in any part of the system. Line sizing shall be such that it will protect the compressor from loss of lubrication at all times, prevent liquid refrigerant from entering the compressor during operating or idle time, and maintain a clean and dry system.

Refrigeration piping shall be Type L, ACR grade, hard drawn seamless copper tubing, wrought type copper fittings, and silver soldered joints. Precharged lines are not acceptable.

Furnish and install sleeves for refrigerant and evaporator drain piping wherever piping passes through a wall or ceiling. Sleeves shall be non-conductive gray plastic tubing, with interior dimension sized at least 1/4" larger than piping, and shall be neatly packed with brine putty after installation.

Furnish and install condensate drain piping from the unit cooler to an open drain. Piping shall consist of not less than 7/8" Type L copper tubing, supported 36" on center maximum, in such a way that there will be 1" clearance between the wall and the tubing. Provide a union or slip fitting at the connection to the evaporator drain pan to allow easy disassembly for service and cleaning. Drain piping shall be pitched 4" to the foot and carried through the wall of the refrigerated area.
It shall be trapped to prevent entry of warm air and insects to the refrigerated rooms and discharged to a floor drain with the code required air gap. The exposed drain piping shall be spray painted.

Provide an electric drainline heater tape in the freezer, with a length equal to five wraps per foot of length of the drainline located within the freezer compartment. Wrap and secure in accordance with manufacturer's recommendations.

Provide chrome plated escutcheon plates at all exposed points where piping penetrates the wall or ceilings.

Insulation - Suction lines for refrigerated rooms having a temperature above freezing shall be covered with 3/4" wall thickness closed cell HT Armaflex insulation with ultra violet radiation protection.

Suction lines for refrigerated rooms having a temperature below freezing shall be covered with 1" wall thickness closed cell HT Armaflex insulation with ultra violet radiation protection.

The insulation shall be applied to these lines in accordance with manufacturer's recommendations, and as they are being installed so that insulation will not be split. All joints shall be completely sealed with overlapping, cemented material to prevent

the formation of frost on the lines.

Controls - Each evaporator shall be provided with an iNtelliGen electronic control as manufactured by Heatcraft Refrigeration. Provide each system with a pair of twisted 24 gauge low voltage wires, Belden 9841 or equal. Wires shall be installed by the Controls Contractor. Wires shall run from the dry contacts at the evaporators to the access control panel. Kitchen Equipment Contractor to verify length prior to purchasing. To avoid false triggering, provide a shielded two-conductor cable with the shield connected to the receiving equipment. The time clock and heater contactor shall

be removed from the condensing unit. No control wiring will be required from evaporator to the condensing unit.

Refrigerant Testing - The entire system shall be pressure and leak tested at no less than 100 PSIG, cleaned and dehydrated by maintaining a vacuum of 500 microns or lower for a period of twelve hours. The required operating charge of refrigerant and oil, if necessary, shall be added and the entire system tested for performance. Each system shall be clearly marked as to the type refrigerant required.

Guarantee - The equipment shall be guaranteed to maintain the specified temperatures. All mechanical refrigeration equipment shall be mechanically guaranteed for a period of one year after date of acceptance by the Owner. The emergency service shall be provided free of charge, whenever necessary on a 24 hour, seven day-per-week basis during the guarantee period.

Any leaks that occur during the first year of operation after acceptance by the Owner, shall be repaired and the necessary refrigerant added at no expense to the Owner.

The year's service shall be provided by the installing company, and under no circumstances will the service policy be sublet to another refrigeration contractor. The name of the installer/service agency for the guarantee period shall be located at a prominent place on the condensing units.

The condensing units shall be provided with an additional four year parts warranty to commence upon the completion of the aforementioned guarantee, bringing the total parts warranty to five years.

Condensing Units - The condensing units shall consist of an EC energy saving motor with variable speed controller, compressor, refrigerant condenser, liquid receiver, compressor service valves, and a dual high-low pressure control. The units shall be as manufactured by Heatcraft Refrigeration.

The condensing units shall be outdoor type, wall mountable, and quiet type with an approximate 51 to 63 decibel rating at 100 percent fan speed. The compressor shall be Microchannel Coil Technology scroll type per schedule, and fitted with coated aluminum fin condenser, suction service valve, discharge service valve, compressor contactor, high and low pressure controls, receiver with fusible plug, liquid shut-off valve and charging port, mounted non-fused disconnect switch, waterproof electrical control box, discharge line vibration eliminator, weather resistant UL painted steel cabinet, access guard, liquid line assembly, suction line filter and vibration eliminator, crankcase heater, and 1-1/2" high raised steel base.

Provide each unit with a AP-S1-T stand and mount on roof per drawings with structural supports, roof penetrations and weatherproofing provided by the General Contractor. Mount with clearance above roof deck per Manufacturers

recommendation.

Evaporator Coils - Each evaporator shall be provided with iNtelliGen electronic control as manufactured by Heatcraft Refrigeration, thermostatic expansion valve, and solenoid valve. The time clock and heater contactor shall be removed from the condensing unit. No control wiring will be required from evaporator to the condensing unit. iNtelliGen Controls to include iIC integration card for BMS connection direct to evaporator controls.

The freezer shall be provided with an automatic electric defrost system consisting of one evaporator coil as indicated in the schedule. Evaporator shall be low profile type six fins per inch complete with variable speed EC energy saving fan motors with controller. Coil shall be NSF and UL Listed.

The cooler shall be provided with one evaporator coil as indicated in the schedule. Evaporator shall be low profile type six fins per inch complete with EC energy saving fan motors. Coil shall be NSF and UL Listed.

Furnish and install 1/4" minimum diameter stainless steel threaded mounting rods for the hanging of the evaporator coils, with stainless steel washers and nuts on the interior ends, and reinforcing angle at the exterior top of the room. Plated steel running thread is not acceptable.

Refrigeration Equipment Schedule

Cooler (8)	Room Temp: +35 degrees F			TD: 10 degrees F	
Condensing unit (10a)	Amps	Ref	BTU/hour	Evap Temp	Cond Temp
BCH0008MCACZC0017	4.7 - 208/3	448A	8,299	+25 degrees F	+95 degrees F
Evaporator coil (10b)	BTU/hour	CFM	Fan amps	Defrost amps	Defrost
type BEL0095AS6AMA ambient	9,992	1,305	1.8 - 120/1	NA	Timed

Freezer (9)	Room Temp:	-10 degrees F		TD: 10 degrees F	
Condensing unit (10c)	Amps	Ref	BTU/hour	Evap Temp	Cond Temp
BCH0022LCACZC0017	7.8 - 208/3	448A	6,509	-20 degrees F	+95 degrees F
Evaporator coil (10d)	BTU/hour	CFM	Fan amps	Defrost amps	Defrost type
BEL0065BS6EEA	7,194	1,371	1 - 208/1	9.1 - 208/1	Timed electric

Item 10a
COOLER CONDENSING UNIT
Specified as part of Item 10

Item 10b
COOLER EVAPORATOR COIL
Specified as part of Item 10

Item 10c
FREEZER CONDENSING UNIT
Specified as part of Item 10

Item 10d
FREEZER EVAPORATOR COIL
Specified as part of Item 10

Item 11
MOBILE SHELVING UNIT, FOUR-TIER
Quantity - 10
Make - MetroMax Q*C166 or equal by Cambro
Size - (2) 48" x 21", (3) 36" x 21", (2) 48" x 18", (2) 36" x 18", and (1) 30" x 21", all 69" high on casters; four tier
Description - Shelving unit shall be all standard construction and shall consist of four shelves with removable injection molded polypropylene mats with antimicrobial product protection, supported on epoxy coated steel shelf frames and similar uprights with capped tops, and mounted on 5" diameter polyurethane tired swivel casters with donut bumpers.

Accessories - Provide with polymer posts in lieu of standard.

Item 12
WASTE BARREL
No work in this Section. Item to be provided by Owner.

Item 13
BLENDER
Quantity - 2
Vitamix Vita-Prep 3
Power - 13 amps - 120/60/1 - cord and plug
Size - 8" x 9" x 7" high (base), 20-1/4" high with container
Description - Unit shall be standard construction per the manufacturer's details with a black polycarbonate base, two-horsepower peak output motor, variable speed dial, on/off switch and pulse switch.
Supplied with a 64 ounce square sided container with four-prong blade, lid and accelerator tool.
Accessories - Provide one additional 64 ounce container with lid, item number 1195 and one additional accelerator tool. Provide a three-year warranty.

Item 14
PREP TABLE WITH SINKS
Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.
Size - 12'-0" x 30" x 36" high to work surface plus 10" high splash at rear; two 18" x 20" x 10" deep integral sink basins
Construction - 14 gauge stainless steel top, basins and splash, channel reinforced, six legs with gussets and adjustable feet, partial undershelf, two crossrails, tall splash rear, and marine front and ends, secured 3" off face of wall.
Accessories - Drawer assembly, splash mounted faucet set and two 2" lever waste outlets.

Item 15
WALL
SHELF

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 12'-0" x 12" mounted 54" above floor

Construction - Wall shelf shall be fabricated of 16 gauge stainless steel with back and ends raised 1-1/2", front edges of ends angled back, all corners broken, and front turned down 1-1/2", and in 1/2" at 45°. Shelf corners shall be welded, ground and polished. Mount shelf 1" off face of wall with suitable fasteners on 14 gauge stainless steel flag brackets, 48" on center maximum. Flag brackets shall have a web angle of 30° measured from horizontal.

Item 16

BLAST CHILLER / SHOCK FREEZER

Make - American Panel

AP10BCF100-2 Size - 29-1/2" x 28-

1/4" x 60-1/2" high

Power - 12 amps - 208/60/1 - cord and plug (NEMA L6-20P)

Description - Blast chiller shall be all standard construction with stainless steel interior, exterior front and ends and coved interior corners. Cabinet walls and floor are insulated with 2-3/4" CFC-free high density polyurethane insulation. Unit shall include automatic interior lighting, fully welded corners of exterior door pans, and a removable magnetic gasket. Microprocessor controls for the self-

contained refrigeration system shall include a heated food probe and for four chilling functions: soft chill, hard chill, shock freeze, and holding. Refrigerant shall be R-404a.

Accessories - Blast chiller shall be provided with cabinet sanitation system, Wi-Fi connectivity, second heated food probe, drain line assembly, and mount on casters.

Item

17

No

item

Item 18

HAND

SINK

Quantity - 3

Make - Advance 7-PS-70-CM*C166 or equal by IMC Teddy or Krowne

Description - Unit shall be all standard stainless steel construction with mounting bracket. Mount on wall with rim at 36 in. above floor

Accessories - Provide with a splash mounted faucet set with wrist handles (Item 18a), 3 in. flat strainer type (non-basket, non-lever) open type waste, chrome plated tailpiece, "P" trap and clean-out cap. Provide two units (adjacent to Items 14 and 38) with a left side welded stainless steel splash.

Item

18a

FAUC

ET

Quantity - 3

Make - T&S Brass B-0330-04 modified or Fisher 1953 modified, or Encore

Description - Unit shall be all standard construction with mixing body, 8 in. center inlets, and

wrist blade handles. Modified unit shall be provided with 119X gooseneck with B-0199-02-F10 aerator tip in lieu of the standard.

Item 19

WASTE

BIN

Quantity - 3

No work in this Section. Item to be provided by Owner.

Item 20

PAN RACK, MOBILE

Quantity - 2

Make - New Age 1332*C166 or equal by

Channel Size - 20-1/2 in. by 26 in. by 69 in.

high

Capacity - Fifteen 18 in. by 26 in. pans on 4 in. centers

Description - Rack shall be fabricated of welded extruded aluminum 1 in. by 1 in. by .070 in. tubular uprights and framing, and 1-1/4 in. by 1-5/8 in. by .100 in. angle pan slides with corners chamfered and deburred. Gussets of 1-1/2 in. by 1-1/2 in. by 5/8 in. angle aluminum shall be welded to the bottom inside angles where horizontal bracing meets vertical uprights. Mount on platform type, 5 in. polyurethane tired swivel casters.

MOBILE WORK TABLE

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 60" x 30" x 36" high

Construction - 14 gauge stainless steel top over angle frame with edges formed in turndown and mounted on four legs with gussets, 5" diameter swivel casters, two with brakes, and full undershelf.

Accessories - Drawer assembly.

Item 22

MOBILE WORK TABLE

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 60" x 30" x 36" high

Construction - 14 gauge stainless steel top over angle frame with edges formed in turndown and mounted on four legs with gussets, 5" diameter swivel casters, two with brakes, and full undershelf.

Accessories - Drawer assembly.

Item 23

VENTILATOR THERMOSTATIC AUTOSTART CONTROL

Make - Econ-Air SC-310110MA (Job # 6540990) or equal by Gaylord or

Halton Power - 15 amps circuit - 120/60/1 to logic controller

Scope - Furnish and install complete exhaust control system for the exhaust canopy in accordance with the plans and Manufacturers shop drawings. The system shall include programmable logic controller (PLC), stainless steel control enclosure, exhaust duct temperature sensors, room temperature sensor, LCD screen interface with cable, all specified accessories, and those components required to provide complete and satisfactory systems in accordance with accepted HVAC practice.

System shall control Item 24. Mount LCD screen control, recessed and flush to wall per plan 54" above floor. Mount LCD screen control in a recessed junction box provided by the General Contractor. Mount system processor in the cabinet mounted on the left end of exhaust ventilator 24. Mount the room air temperature sensor on the wall 60" above the finished floor.

Important: The installation work shall be performed by a fully qualified contractor employing a certified mechanic fully trained in the installation of the hood system. Submittal shall list the installing company and the qualified system installer. Provide wiring diagrams and guidance to related trades to achieve correct operation of the system.

Accessories - Service Design Verification: Factory Services and on site coordination to be performed by the Manufacturers service technician (not a sales representative). On site supervision shall include two site visits: One visit to coordinate preparations for installation, and a second visit at startup and calibration. Provide BacNet monitoring system.

Item 23a

VENTILATOR CONTROL INTERFACE SCREEN

Specified as part of Item 23

Item 23b

ROOM TEMPERATURE SENSOR

Specified as part of Item 23

EXHAUST VENTILATOR

Make - Econ-Air 6024 EX-2 (Job # 6540990) or equal by Gaylord or Halton

Size - 8'-0" plus a 12" utility cabinet at left end x 60" x 24" high plus 4" high collars, mounted up 6'-8" above finished floor; flat bottom

Power - 120/60/1 power to lights from Item 23

Exhaust - 1,400 CFM through a 12" diameter collar at -0.8" static pressure. Blower and ductwork provided and installed by Ventilation Contractor.

Description - Ventilator shall be of all standard construction, built of not less than 18 gauge 304 stainless steel throughout with welded joints and seams in accordance with NFPA-96, with reinforced front bottom edge with integral front baffle, double wall insulated front, and NSF Listed. Unit shall have grease collection trough, storage container, and hanger brackets. Provide with 430 stainless steel Captrate Grease-Stop Solo Filter UL classified S-baffle extractors that shall remove at least 75% of grease particles five microns in size, and 90% of grease particles seven microns in size and larger, with a corresponding pressure drop not to exceed 1.0 inches of water gauge. Provide all materials necessary for the hanging of the ventilator, and seal to wall.

Accessories - Provide unit with four recessed UL Listed light LED fixtures factory prewired and left ready for final connection by the Electrical Contractor. Provide closure trim per detail to a point 3" above finished ceiling to close to adjacent surfaces on three sides. Provide a full System Design Verification to be performed by a Factory Certified Technician once system start-up and inspections are completed.

Item 25

COMBINATION OVEN WITH MOBILE STAND

Make - Convotherm C4eT 6.20

GB-N Power - 7.5 amps -

120/60/1

Rating - 3/4" gas inlet at 68,200 BTU/Hour

Capacity - Six 18” x 26” full size sheet pans or twelve 12” x 20” x 2-1/2” steam table pans

Description - Combination oven steamers shall be all standard construction with three

operating modes: steam, hot air, and combi-steam, five moisture removal levels, five baking function levels, five humidity settings, and five fan speed settings, touch screen control, fully automatic cleaning system, ethernet interface, antibacterial touch screen, door handle, and shower handle, control panel integrated USB port, visual operating status indicator, steam generated by high- performance boiler outside the cooking chamber, and right hinged door.

Accessories - Provide with mobile stainless steel stand with undershelf, WiFi enabled, and starter package of cleaning system products. Provide with two 48" long Dormont W75B48 flexible water supply lines, and a 48" long x 3/4" line size Dormont 1675 KIT2S plastic covered hose assembly with full port gas ball valve, two Supr-Swivels, brass disconnect, 90° street elbow and restraining cable. Mount the nipple on the rear of the oven, and the hose assembly with disconnect device connected to the building supply line.

Item 26

WATER FILTER ASSEMBLY

Make - 3M ScaleGard HT SF165 Modified or equal by Everpure or Optipure

Description - Unit shall be all standard construction designed for wall mounting per plan and consisting of a mounting bracket, quarter-turn cartridge release mechanism, manifold with integral pressure gauge, integral quarter turn shut-off valve, outlet check valve, filter cartridge with internal prefilter membrane and external scale feeder cartridge. Provide with HF95-CLX chloramine reduction filter cartridge in lieu of standard HF65 cartridge.

Accessories - Provide four spare HF95-CLX filter cartridges and four spare HF8-S cartridges.

Item 27

TEN-PAN STEAMER

Make - Market Forge ETP-10G

Power - 15 amps circuit - 120/60/1 - cord

and plug Rating - 3/4" gas inlet at 84,000

BTU/Hour

Description - Steam cooker shall be all standard construction with two five-pan capacity compartments mounted on a stainless steel cabinet base with close coupled individual atmospheric steam generators mounted at the rear of the compartments with pilotless ignition system, automatic water level control, low water cut-off, built-in water filtration system, safety relief valve, pre-heat and high limit thermostats, condensate and water tempering tank, and delimer/descaler port. Compartments shall be fitted with stainless steel liners and removable pan supports, and shall be independently and automatically controlled with 60 minute electromechanical timer with continuous end of cooking signal, and holding mode. Doors to be field reversible, positive closing, insulated, slam action type with one-piece silicone rubber gasket and door interlock to cut power to the heater when the doors are opened. Mount cabinet base on 6" high stainless steel adjustable legs.

Accessories - Provide unit with ten 12" x 20" x 2-1/2" deep stainless steel pans; six perforated and four solid, and replacement filter kit. Mount unit on casters and provide with a 36" long Dormont 72- 2125-36 flexible water supply line with quick disconnect, and a 36" long x 3/4" line size Dormont 1675 KIT2S plastic covered hose assembly with full port gas ball valve, two Supr-Swivels, brass disconnect, 90° street elbow and restraining cable. Mount the nipple on the rear of the oven, and the hose assembly with disconnect device connected to the building supply line.

Item 28

STAINLESS STEEL WALL FLASHING

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts,

SML Stainless Steel Group, or Julien Inc.

Size - 8'-0" long extending from bottom of ventilator to floor or top of coved material (approximately 8" above finished floor)

Construction - Wall shall be clad with 20 gauge stainless steel cut in largest sheets to minimize joints and secured to wall with stainless steel fasteners. All joints shall be covered with batten strips, cap strips at ends, and care taken to avoid distortions at fasteners. Provide carefully punched holes at all service locations.

Item 29

COOK'S WORK TABLE

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 7'-0" x 30" x 36" high

Construction - 14 gauge stainless steel top over angle frame, edges formed in turndown, six legs with gussets, adjustable feet, two crossrails and partial undershelf.

Accessories - Drawer assembly. Provide two rigid stainless steel brackets for mounting of electric outlets in setback positions complete with work boxes, GFI receptacles and stainless steel cover plates. Prewire receptacles through table legs to a mounted junction box below the undershelf.

Item 30

MOBILE WORK TABLE

Quantity - 2

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 48" x 30" x 36" high

Construction - 14 gauge stainless steel top over angle frame with edges formed in turndown and mounted on four legs with gussets, 5" diameter swivel casters, two with brakes, and full undershelf.

Accessories - Drawer assembly.

Item 31

MOBILE SHELVING UNIT, FOUR-TIER

Quantity - 4

Size - 36" x 21" x 69" high on casters; four tier

Description - Shelving unit shall be all standard construction and shall consist of four shelves with removable injection molded polypropylene mats with antimicrobial product protection, supported on epoxy coated steel shelf frames and similar uprights with capped tops, and mounted on 5" diameter polyurethane tired swivel casters with donut bumpers.

Accessories - Provide with polymer posts in lieu of standard.

Item 32

CLEAN WARE TABLE

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 48" x 30" x 34" high plus 10" splash at wall; 3" high raised roll at front and end

Construction - 14 gauge stainless steel top and splash over channel frame with raised roll front and end, tall splash at rear, turned down into dishwasher and secured with stainless steel machine screws, and mounted on two legs with gussets, and adjustable feet. Provide a 33" long undershelf welded to table legs at one end and mounted at opposing end on two 10" high legs with gussets, and adjustable feet. Secure table 3" off face of wall.

Item 33

WATER FILTER

Make - WaterSpec WS-SSEXT or equal by 3M, Everpure, or Hobart

Description - Unit shall be all standard construction designed for vertical wall mounting per plan and consisting of a mounting bracket, manifold, and filter cartridge with housing. Assembly shall have an operating inlet water temperature range of 35 to 160 degrees Fahrenheit.

Accessories - Provide four spare SS-EXT filter cartridges.

Item 34

WAREWASHER, DOOR-TYPE, VENTLESS

Make - Hobart AM16VLT-BAS (Hot Water Sanitizing) or equal by Champion or

Meiko Power - 53.7 amps - 208/60/3

Maximum Water Use - 0.64 Gallons per

Rack Certification - Unit shall be Energy

Star compliant

Description - Dishwasher shall be door type with extended hood of all standard construction with 40 rack per hour capacity, 16 gauge stainless steel drawn tank, 18 gauge stainless steel chamber, and 12 gauge stainless steel frame and stainless steel feet, ventless energy recovery, touchscreen controls, WiFi connectivity, two stage filtration, pillarless opening, three-sided hood, pumped drain, door lock, timed wash cycles for 1, 2, 4 or 6 minutes, NSF pot and pan rating for 2, 4, and 6

minute cycles, 70°F rise integral electric booster heater, 27" door opening for 18" x 26" sheet pans or 60-quart, spring counterbalanced chamber, X-shaped revolving, interchangeable upper and lower anti-clogging wash arms, revolving, interchangeable upper and lower rinse arms, slanted, self-locating, one-piece scrap screen and, basket system, automatic fill, door actuated start. Pump shall be stainless steel with stainless steel impeller and shaft, fitted with a stainless steel and carbon ceramic seal, capable of 160 gallon per minute flow and self draining. Motor shall be 2 HP, three phase, squirrel cage, induction-run type with inherent thermal protection, grease packed ball bearings, splashproof design, and ventilated.

Accessories - Single point electrical connection, and four plastic racks; two peg, two flat, sheet pan rack.

Provide drain water tempering kit and splash shield for corner installation.

Item 35

DISPOSER

Make - In-Sink-Erator SS-200-18A*C166 or equal by Salvajor or Red

Goat Power - 3.3 amps - 2 HP - 208/60/3

Description - Disposer shall be all standard construction with stainless steel grinding chamber, Hycar resilient mounting with chrome plated exterior, and grinding chamber water inlet. Motor shall be clad with a stainless steel cover and shall be totally enclosed, fan cooled, induction type with built-in manual reset inherent thermal overload protection, double tapered Timkin roller bearings, centrifugal moisture shield, pressure relief vent, timed or continuous run operation options, and provided with two 24 volt solenoid valves and two flow control valves (1 GPM & 7 GPM). Weld cone integral with the drainboard.

Accessories - Provide unit with a No. 18A cone assembly integral with the drainboard, complete with safety baffle and stopper, bowl cover, water inlet for mounting in sink basin, a solenoid valve, vacuum breaker, and an AS-101 AquaSaver control center for mounting on fabricator provided bracket below the dish table.

Item 36

DISPOSER CONTROL PANEL

Specified as part of Item 35

Item 37

HOSE REEL ASSEMBLY

Make - T&S Brass B-7102-U1JXS9E or equal by Fisher or Reel

Craft Size - 12 foot hose, 3/8" ID

Maximum Water Use - 1.07 Gallons per minute

Description - Unit shall be all standard construction with stainless steel open type reel, adjustable bumper, blue hose, B-107-J low flow spray valve, heat resistant spray valve handle, chrome risers, two wall brackets, continuous pressure vacuum breaker with integral check valve, 36" flexible water hose, control valve, and deck type base faucet, designed for wall mounting per plan up 7'-6" measured at the inlet.

Accessories - Provide with G019430-45 stainless steel wall mount swing bracket.

Installation - The hose reel bracket for wall mounted units shall be rotated 90° downward and installed such that it allows the hose to hang straight down and parallel to the wall. Refer to T&S Brass instructions manual page four figure one for further details.

Item 38

THREE-COMPARTMENT SINK

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 12 ft., 0 in. by 30 in. by 34 in. high plus 10 in. high splash at wall; 3 in. high raised open roll at front and end; three 21 in. by 27 in. by 12 in. deep integral sink basins

Construction - 14 gauge stainless steel top, basins and splash, stainless steel channel reinforced, eight legs with gussets, adjustable feet, and eight lengths of crossrail. Secure 3 in. off face of wall. Top of splash shall be fitted with integral flat spot for mounting of the pre-rinse fixture. Turn end down into dishwasher and secure with stainless steel machine screws and nuts. Provide the three wash basins each with a lift out, 16 gauge stainless steel cover with all edges flanged down 1 in., corners rounded and welded, provided with two neatly punched thumb holes, and designed to rest on 1/4 in. rod stock supports welded across the basin corners at proper height to provide a flush surface. Provide a hook under the drainboard for hanging the lids when not in use.

Integral scrapping sink shall be provided with a 2 in. by 1/4 in. bar stock rack guide attached to the reinforced splash with stainless steel through bolts. Integral scrapping sink shall be provided with disposer water inlet mounted, and a 2" x 1/4" bar stock rack guide attached to the reinforced splash with stainless steel through bolts. Weld disposer cone integral with drainboard and provide a rigid stainless steel control switch mounting bracket.

Accessories - Provide unit with two splash mounted pot sink faucet sets and three 2 in. lever waste outlets.

Item 39

WALL SHELF

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 60" x 12" mounted 54" above floor

Construction - Wall shelf shall be fabricated of 16 gauge stainless steel with back and ends raised 1-1/2", front edges of ends angled back, all corners broken, and front turned down 1-1/2", and in 1/2" at 45°. Shelf corners shall be welded, ground and polished. Mount shelf 1" off face of wall with suitable fasteners on 14 gauge stainless steel flag brackets, 48" on center maximum. Flag brackets shall have a web angle of 30° measured from horizontal.

Item 40

MILK COOLER

Make - True TMC-34-S-DS-SS-HC or equal by Beverage Air

Size - 34" x 33" x 46-3/4" high; eight 13" x 13" x 11" milk crate

capacity Power - 2.7 amps - 120/60/1 - cord and plug

Description - Milk cooler shall be all standard construction with stainless interior and exterior. Self-contained refrigeration system with thermostatic controls, R290 refrigerant, polyurethane foam insulation, and hinged stainless steel removable service doors. Unit provided with digital exterior temperature display. Mount on 4" diameter swivel casters.

Item 41

WORK TABLE

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 84" x 30" x 36" high plus 6" splash at wall

Construction - 14 gauge stainless steel top over angle frame with three edges formed in turndown and rear formed in short splash, mounted on six legs with gussets, adjustable feet and full undershelf.

Accessories - Drawer assembly.

Item 42

REFRIGERATOR, REACH-IN

Make - Continental DL2RNSA*C166 or equal by Traulsen or Victory

Power - 6.3bamps - 1/3 HP - 120/60/1 - cord and plug

Doors - Half height, center opening

Capacity - 50.0 cubic feet

Certification - Unit shall be Energy Star compliant

Description - Refrigerator shall be all standard construction with stainless steel exterior front and ends of welded construction to include door corners, and aluminum interior. Unit shall include 3" thick polyurethane foam insulation, automatic interior lighting, hot gas condensate evaporator, self- closing cam lift door hinges with 120° stay open feature, plasticized fin coil and fan blades, stainless steel breaker strips, exterior reading thermometer and mounted on stainless steel adjustable legs. Refrigeration system shall be self-contained, with thermostatic expansion valve, capable of maintaining +38 to +40°F temperatures, with automatic defrost and operating on Refrigerant R-290.

Accessories - Mount on casters. Provide unit with optional five year compressor warranty, two adjustable chrome plated steel wire shelves in the bottom half and 18 pair of Type A stainless steel bottom support angle type pan slides spaced 3" on center in the top half.

Item 43

COLD PAN, THREE-PAN, DROP-IN

Make - Hatco CWB-3*C166 or equal by or

Wells Size - 45 in. by 27 in. by 25-1/2 in. high

Power - 6.7 amps - 1/4 HP - 120/60/1 phase - cord and plug

Description - The NSF 7 approved refrigerated drop-in well shall be standard construction per the manufacturer's standard details with an angled interior wall design. Unit shall utilize R-513A refrigerant and consist of aluminized steel housing with a stainless bezel, mounted electronic temperature control, pan support bars for full-size pans, condenser unit (can be rotated), compressor with flexible refrigerant lines, sight glass, service valves, receiver, and dryer/filter.

Accessories - Provide optional five year warranty on the compressor. Provide with 20 in. pan support bars and perforated false bottom. Provide with loose control enclosure for mounting in counter apron.

Item 44

SERVING COUNTER

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 14 ft., 4 in. by 33 in. plus 10 in. tray slide by 34 in. high; 30 in. high to top of

trayslide Power - 20 amps circuits - 120/60/1 to each of two apron mounted GFI

outlets;

20 amps circuits - 120/60/1 to body mounted GFI outlet at cold pan;

3.6 KW - 208/60/1 to disconnect for four hot food wells

Construction - Provide raw openings for the hot food wells and a flanged opening for the refrigerated pan with all edges flanged down 1" and corners filled and welded.

Mount on four 2 in. square 16 gauge stainless steel tubular legs with Component Hardware

A15- 0851 adjustable feet. Reinforce between all front and end legs with 2 in. square stainless steel tubing welded in place 6-1/4 in. clear above floor. Provide similar reinforcement between rear legs where an undershelf does not exist.

Undershelves shall be fabricated of 16 gauge stainless steel with reinforcing and sound deadening as specified for open base table undershelves. Front face shall be turned down 1-1/2 in. and in 1/2 in. at 45 degrees. Rear and ends shall be turned up 1-1/2 in. and corners welded. Weld to legs at a point 10 in. above floor. Shelf shall be mounted on the inside face of legs, not cut-out at each leg. Leave 2 in. clearance between the shelf edge and the counter front and end panels for passing of services by Related Trades.

Trayslide shall be fabricated of 14 gauge stainless steel with front and ends turned down and corners welded. Rear shall be turned up under the counter front edge Mount on Component Hardware J19-4966 brackets bolted through the front panels to reinforced area.

Front and ends of counter shall be provided with plastic laminate clad panels. Plastic laminate manufacturer shall be as selected by the Architect. Plastic laminate color shall be as selected by the Architect from a full range of colors. Panels shall be mounted with a minimum of joints. All joints to be hairline type. Joint between a front and end panel shall appear on the end panel face. Panels shall be secured to counter legs and crossrails with welded stainless steel clips and stainless steel wood screws. Do NOT secure THROUGH the legs or crossrails. Provide a continuous 14 gauge support-protector strip at the lower edge of all finish panels, extending 1/16 in. past front face.

Apron shall be provided per elevations, fabricated of 18 gauge stainless steel, and shall be used for the mounting of switches, outlets, and controls. Apron shall include a formed reinforced bottom edge and shall be set in 1 in. from leg face.

Accessories - Provide with a 50 in. long (between end posts on centers) Versa-Gard VG9 two-tier self- serve glass food display cases (Item 44a) with brushed stainless steel uprights, top glass, end panels, surface mount flanges with covers, and mounted per plan. Provide with a 66 in. long (between end posts on centers) Versa-Gard VG6S-CT full-service food protector (Item 44b) with brushed stainless steel uprights, end panels, surface mount flanges with covers, and mounted per plan.

Item 44a
TWO-TIER SELF-SERVE GLASS FOOD DISPLAY CASE
Specified as part of Item 44

Item 44b
FULL-SERVICE GLASS FOOD PROTECTOR CASE
Specified as part of Item 44

Item 45
HOT FOOD WELL, DROP-IN
Quantity - 4
Make - Wells MOD-100D or equal by Hatco or Alto-Shaam
Power - 0.9 KW - 208/60/1
Description - Modular food warmer shall be all standard construction and shall consist of a stainless steel mounting frame, gasket and locking system, stainless steel 6" deep "wet or dry" hot food well with 1" thick fiberglass insulation on five sides enclosed in an aluminized steel enclosure, and an infinite heat control with mounting panel for installation in the counter apron complete with gasket, lead wires encased in flexible armored conduit, drain outlet, and

mounting hardware. Wells shall be Fabricator wired to a single point with disconnect switch in accordance with UL Requirements.

Accessories - Mount in a group of four and provide with a quarter turn ball type shut-off valve and Fabricator installed 3/4" copper manifold connecting the wells, complete with cleanout, left ready for extending to the floor drain by the Plumbing Contractor.

Item 46

FILL FAUCET

Make - T&S Brass B-0208 or equal by Fisher or Encore

Description - Unit shall be all standard construction with a B-199-02F-12 aerator tip.

Item 47

MOBILE HOT FOOD HOLDING CABINET

Quantity - 2

Make - Food Warming Equipment MTU-12*C166 or equal by Vulcan or Alto-

Shaam Size - 29-3/4" x 30-1/4" x 69" high

Power - 13.85 amps - 16.5 KW - 120/60/1 - cord and plug

Certification - Unit shall be Energy Star compliant

Description - Cabinet shall be all standard construction with stainless steel interior and exterior, stainless steel base frame with tubular perimeter and 10 gauge stainless steel reinforcing plates at corners, high density fiberglass insulation on all sides, flush mounted door with high temperature gasket mounted on the cabinet, edge mounted heavy duty hinges and latch, twelve pair of removable universal chrome plated and epoxy coated rod type pan slides capable of supporting 18" x 26" or 12" x 20" pans on 4-1/2" centers, mounted thermometer, recessed controls, thermostatically controlled system with separate heat and humidity controls, air distribution blower and removable stainless steel reservoir, and 10' cord set and cord storage loop. Mount on 5" diameter plate mounted polyurethane tired casters; two swivel, two rigid. Provide with two year warranty.

Accessories - Provide unit with see-thru Lexan Dutch doors, perimeter vinyl bumper and push/pull handles.

Item 48

CASHIER TERMINAL

No work in this Section. Item to be provided by Owner.

Item 49

MOBILE CASHIER STAND

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 30" x 30" x 36" high main section with 42" x 10" folding trayslide set at 30" above floor

Construction - 14 gauge stainless steel top over angle frame with all edges turned down 2" and corners

welded. Mount on four 2" square legs with crossrails on three sides, footrest set in 8", undershelf

and plastic laminate clad panels on three sides and a solid mounted trayslide all of similar construction to the serving counter. Mount trayslide on fold down brackets. Provide 3" diameter grommeted hole in top below rear of cashier terminal for passage of cables. Provide 5" diameter swivel casters; two with brakes.

Accessories - Provide unit with a Component Hardware S95-1000 locking cashier drawer.

STORAGE SHELVING, FIVE-TIER

Quantity - 3

Make - Metro Super Adjustable Super Erecta or equal by Cambro

Size - (2) 48" x 24" and (1) 36” x 24”, all 63" high; four tier with bottom shelf up 14" clear above floor

Description - Unit shall be all standard construction with Super Adjustable Metroseal coated wire shelves
and tubular steel uprights with capped tops, adjustable feet, and 1" shelf height adjustment
capability with Corner Release System. Each unit shall include four legs.

Item C02

WORK TABLE

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 9'-0" x 30" plus a 27" x 33" extension x 36" high plus 6" splash at walls

Construction - 14 gauge stainless steel top over angle frame with three front and ends formed in turndown and rear formed in short splash, mounted on ten legs with gussets, adjustable feet, two crossrails and partial undershelf. Secure to wall and seal.

Item C03

MICROWAVE OVEN

Make - Amana RFS12TS or equal by

Panasonic Size - 21-3/4" x 20" x 14-3/4" high

Power - 16 amp - 120/60/1 - cord and plug (NEMA 5-20)

Description - Microwave oven shall be all standard construction with 1200 watt nominal cooking power, oven stirrer fan, stainless steel interior and exterior, full length stainless steel piano door hinge, slotted choke door seal, see through door window with interior light, ceramic cooking shelf, ten station programmable touch control timer, 100 programmable settings, five power level options, end of cycle signal and three year warranty.

Item C04

FOOD PROCESSOR

Make - Robot Coupe R301 Ultra Dice*C166 or equal by Berkel or

Hobart Power - 12 amps - 120/60/1 - cord and plug

Description - Combination food cutter shall be all standard construction with 1-1/2 HP direct drive fan cooled capacitor start motor with brake, magnetic interlocks, stainless steel cutter bowl with handle and see-thru lid, continuous feed top unit with attached large feed pusher, two standard discs and dicing kit.

Item C05

BLENDER

Vitamix Vita-Prep 3

Power - 13 amps - 120/60/1 - cord and plug

Size - 8" x 9" x 7" high (base), 20-1/4" high with container

Description - Unit shall be standard construction per the manufacturer's details with a black polycarbonate base, two-horsepower peak output motor, variable speed dial, on/off switch and pulse switch.
Supplied with a 64 ounce square sided container with four-prong blade, lid and accelerator tool.

Accessories - Provide one additional 64 ounce container with lid, item number 1195 and one additional accelerator tool. Provide a three-year warranty.

Item C01

Item C06

EXHAUST VENTILATOR

Make - Econ-Air 6024 EX-2 (Job # 6540990) or equal by Gaylord or Halton

Size - 8'-0" plus a 12" utility cabinet at right end x 60" x 24" high plus 4" high collars, mounted up 6'-8" above finished floor; flat bottom

Power - 120/60/1 power to lights from Item C07

Exhaust - 1,600 CFM through a 14" diameter collar at -0.551" static pressure. Blower and ductwork provided and installed by Ventilation Contractor.

Description - Ventilator shall be of all standard construction, built of not less than 18 gauge 304 stainless steel throughout with welded joints and seams in accordance with NFPA-96, with reinforced front bottom edge with integral front baffle, double wall insulated front, and NSF Listed. Unit shall have grease collection trough, storage container, and hanger brackets. Provide with 430 stainless steel Captrate Grease-Stop Solo Filter UL classified S-baffle extractors that shall remove at least 75% of grease particles five microns in size, and 90% of grease particles seven microns in size and larger, with a corresponding pressure drop not to exceed 1.0 inches of water gauge. Provide all materials necessary for the hanging of the ventilator, and seal to wall.

Accessories - Provide unit with four recessed UL Listed light LED fixtures factory prewired and left ready for final connection by the Electrical Contractor. Provide closure trim per detail to a point 3" above finished ceiling to close to adjacent surfaces on three sides. Provide a full System Design Verification to be performed by a Factory Certified Technician once system start-up and inspections are completed.

Item C07

VENTILATOR DEMAND CONTROL SYSTEM

Make - Econ-Air DCV-1011 (Job # 6540990) or equal by Gaylord or

Halton Power - 15 amps circuit - 120/60/1 to logic controller

Scope - Furnish and install complete exhaust control system for the exhaust canopy in accordance with the plans and Manufacturers shop drawings. The system shall include programmable logic controller (PLC), variable frequency drive (VFD), stainless steel control enclosure, exhaust duct temperature sensors, room temperature sensor, LCD screen interface with cable, all specified accessories, and those components required to provide complete and satisfactory systems in accordance with accepted HVAC practice. System shall control Item C06. Mount LCD screen control, recessed and flush to wall per plan 54" above floor. Mount LCD screen control in a recessed junction box provided by the General Contractor. Mount system processor in the cabinet mounted on the right end of exhaust ventilator C06. Mount the room air temperature sensor on the wall 60" above the finished floor.

Important: The installation work shall be performed by a fully qualified contractor employing a certified mechanic fully trained in the installation of the DCV hood system. Submittal shall list the installing company and the qualified system installer. Provide wiring diagrams and guidance to related trades to achieve correct operation of the system.

Accessories - Service Design Verification: Factory Services and on site coordination to be performed by the Manufacturers service technician (not a sales representative). On site supervision shall include two site visits: One visit to coordinate preparations for installation, and a second visit at startup and calibration. Provide BacNet monitoring system.

Item C07a

VENTILATOR CONTROL INTERFACE SCREEN

Specified as part of Item C07

Item C07b
ROOM TEMPERATURE SENSOR
Specified as part of Item C07

Item C08
FIRE SUPPRESSION SYSTEM
Make - Ansul R-102 or equal by Kidde or Pyro-Chem
Protection for hood: C06
Design - Provide an automatic liquid fire suppressant system sized to meet all local codes, UL 300 and NFPA Codes. System shall provide surface protection for cooking equipment, hood and the exhaust duct work, if required. Tanks shall be mounted in the hood manufacturer provided utility cabinet and piping shall run hidden wherever possible. All pipes and fittings used to convey the chemical shall be scale free steel, 40 weight. Exposed piping located within the ventilator shall be stainless steel or chrome and limited to vertical drops only. Horizontal piping shall be run over the ventilator's top. Nozzles shall be swivel type with metal caps. Detection shall be fusible links rated per codes, and system shall rely on no outside source of power. The system shall be provided with a control box with indicator to indicate system status. Control head shall also include integral micro switch offering "normally open" and "normally closed" terminals for use by the Electrical Contractor for the shut-down of equipment and the sounding of alarms, etc.
Suppressant tanks shall be stainless steel. Provide a properly sized mechanically operated gas shut-off valve (up to 3" diameter) for mounting by the Plumber at a point in the gas supply that will shut off fuel to all gas fired equipment. Provide and install a remote pull station per codes, complete with cables, conduit and pulleys. Coordinate installation of remote pull station with General Contractor to provide a recessed junction box mounted for installing the pull box with cable conduit concealed within walls. Provide system with class-K extinguisher as required.
Workmanship - Exposed stainless steel fittings and piping shall be assembled with special care to avoid marring or damaging the surfaces. Any pieces showing marks shall be removed and replaced with new materials. Chrome sleeves are not acceptable.
Test - Perform a puff test on the completed system and obtain the written approval of the local Fire Inspector.
Accessories - Provide metal blow-off caps on all nozzles.

Item C09
DOUBLE CONVECTION OVEN
Make - Blodgett ZEPHAIRE-200-G-ES Double
Size - 38-1/4” x 46” to include fan motor by 70-5/8”
high Power - (2) 8 amps - 3/4 HP - 120/60/1 - cords
and plugs Rating - 3/4" gas inlet at 100,000 BTU/Hour
Certification - Unit shall be Energy Star compliant
Description - Units shall be all standard construction with stainless steel front, sides and top, porcelain enameled steel interior with 29" x 28-1/4" x 20" high inside dimensions, 1” solid block insulation and 1" thick mineral fibre sheet insulation for 2” on insulation on top, back and sides, simultaneously operating doors with stainless steel framed dual pane thermal glass windows, removable rack supports capable of holding eleven racks and five chrome plated steel wire racks, electronic ignition with fail-safe controls, solid state manual controls with separate dials for temperature and time settings, timer with buzzer, removable dual tube burners, pressure regulators, two-speed blowers with thermal overload protection and door interlock, and interior lighting with two halogen bake oven lamps. Provide standard one year parts and labor warranty on the total

Item C01 oven and additional three year warranty on the door assembly, parts only.
Accessories - Mount on heavy duty swivel casters. Manifold the two ovens for a single gas connection.

Item C10
INDUCTION COOKER, COUNTER TOP
Quantity - 2
Make - Equipex GL2-5000F
Size - 14-5/8" x 28-3/4" x 5-1/2" high
Power - 21 amps - 5.0 KW - 208/60/1 - cord and plug (NEMA L6-30P)
Description - Unit shall be all standard construction per the manufacturer's specification

Item C11
EQUIPMENT
STAND
Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.
Size - 36" x 30" x 30" high
Construction - 14 gauge stainless steel top over angle frame with edges formed in turndown, mounted on four legs with gussets, adjustable feet and full undershelf.

Item C12
STAINLESS STEEL WALL FLASHING
Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.
Size - 8'-0" long extending from bottom of ventilator to floor or top of coved material (approximately 8" above finished floor)
Construction - Wall shall be clad with 20 gauge stainless steel cut in largest sheets to minimize joints and secured to wall with stainless steel fasteners. All joints shall be covered with batten strips, cap strips at ends, and care taken to avoid distortions at fasteners. Provide carefully punched holes at all service locations.

Item
C13 No
item

Item
C14 No
item

Item C15
WALL
SHELF
Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.
Size - 8'-0" x 12" mounted 54" above floor
Construction - Wall shelf shall be fabricated of 16 gauge stainless steel with back and ends raised 1-1/2", front edges of ends angled back, all corners broken, and front turned down 1-1/2", and in 1/2" at 45°. Shelf corners shall be welded, ground and polished. Mount shelf 1" off face of wall with suitable fasteners on 14 gauge stainless steel flag brackets, 48" on center maximum. Flag brackets shall have a web angle of 30°

measured from horizontal.

Item C16

PREP TABLE WITH SINKS

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 8'-0" x 30" x 36" high to work surface plus 10" high splash at rear; two 18" x 20" x 10" deep integral sink basins

Item C01

Construction - 14 gauge stainless steel top, basins and splash, channel reinforced, six legs with gussets and adjustable feet, partial undershelf, two crossrails, tall splash rear, and marine front and ends, secured 3" off face of wall.

Accessories - Drawer assembly, splash mounted faucet set and two 2" lever waste outlets.

Item C17

WASTE BIN

No work in this Section. Item to be provided by Owner.

Item C18

REFRIGERATOR, REACH-IN

Make - Continental 1RENHDSA or equal by Traulsen or

Victory Size - 28-1/2” x 34” (plus handles) x 83-1/4” high

Power - 5.9 amps - 1/4 HP - 120/60/1 - cord and plug (NEMA 5-

15P) Doors - Half height, hinged on right

Capacity - 21 cubic feet

Certification - Unit shall be Energy Star compliant

Description - Refrigerator shall be all standard construction with stainless steel exterior front and ends of welded construction to include door corners, and aluminum interior. Unit shall include 3" thick polyurethane foam insulation, automatic interior lighting, hot gas condensate evaporator, self- closing cam lift door hinges with 120° stay open feature, plasticized fin coil and fan blades, stainless steel breaker strips, exterior reading thermometer and mounted on stainless steel adjustable legs. Refrigeration system shall be self-contained, with thermostatic expansion valve, capable of maintaining +38 to +40°F temperatures, with automatic defrost and operating on Refrigerant R-290.

Accessories - Mount on casters. Provide unit with optional five year compressor warranty, adjustable chrome plated steel wire shelf in the bottom section, nine pair of Type A stainless steel angle type pan slides spaced 3" on center in the top section.

Item C19

FREEZER, REACH-IN

Make - Continental 1FENHDSA or equal by Traulsen or

Victory Size - 28-1/2” x 34” (plus handles) x 83-1/4” high

Power - 7.6 amps - 1/2 HP - 120/60/1 - cord and plug (NEMA 5-

15P) Doors - Half height, hinged on right

Capacity - 21 cubic feet

Description - Refrigerator shall be all standard construction with stainless steel exterior front and ends of welded construction to include door corners, and aluminum interior. Unit shall include 3" thick polyurethane foam insulation, automatic interior lighting, hot gas condensate evaporator, self- closing cam lift door hinges with 120° stay open feature, plasticized fin coil and fan blades, stainless steel breaker strips, exterior reading thermometer and mounted on stainless steel adjustable legs. Refrigeration system shall be self-contained, with thermostatic expansion valve, capable of maintaining +38 to +40°F temperatures, with automatic defrost and operating on Refrigerant R-290.

Accessories - Mount on casters. Provide unit with optional five year compressor warranty.

MOBILE WORK TABLE

Quantity - 3

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 60" x 30" x 36" high

Construction - 14 gauge stainless steel top over angle frame with edges formed in turndown and mounted on four legs with gussets, 5" diameter swivel casters, two with brakes, and full undershelf.

Accessories - Drawer assembly.

Item C21

WORK TABLE

Quantity - 2

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 8'-0" x 30" x 36" high

Construction - 14 gauge stainless steel top over angle frame, edges formed in turndown, six legs with gussets, adjustable feet, two crossrails and partial undershelf.

Accessories - Drawer assembly. Provide three rigid stainless steel brackets for mounting of electric outlets in setback positions complete with work boxes, GFI receptacles and stainless steel cover plates. Prewire receptacles through table legs to a mounted junction box below the undershelf.

Item C22

WORK TABLE

Quantity - 2

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 8'-0" x 30" x 36" high

Construction - 14 gauge stainless steel top over angle frame, edges formed in turndown, six legs with gussets, adjustable feet, two crossrails and partial undershelf.

Accessories - Drawer assembly. Provide three rigid stainless steel brackets for mounting of electric outlets in setback positions complete with work boxes, GFI receptacles and stainless steel cover plates. Prewire receptacles through table legs to a mounted junction box below the undershelf.

Item C23

MOBILE WORK TABLE, ACCESSIBLE

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 60" x 30" x 34" high

Construction - 14 gauge stainless steel top over angle frame with edges formed in turndown and mounted on four legs with gussets, 5" diameter swivel casters, two with brakes, and three crossrails.

Item C24

No item

Item C25

No item

Item C26

HAND SINK, ACCESSIBLE

Make - Advance 7-PS-25 modified or equal by IMC Teddy or Krowne

Size - 20 in. by 24 in. by 13 in. high overall, 14 in. by 16 in. by 5 in. deep sink bowl

Description - Unit shall be all standard stainless steel construction with wall mounting bracket. Mount on wall with rim at 34 in. above floor. Modify faucet holes to be two holes spaced 8 in. apart on center. Delete standard faucet.

Accessories - Provide deck type faucet (Item 51a), deck mounted soap dispenser, 3 in. flat strainer type (non-basket, non-lever) open type waste, chrome plated tailpiece, "P" trap and clean-out cap.
Provide with welded stainless steel right side splash.

Item
51a
FAUCE
T

Make - T&S Brass B-0322-04 modified or equal by Fisher or Encore

Description - Unit shall be all standard construction with deck mounted mixing body, 8" center inlets, and wrist blade handles. Modified unit shall be provided with B-0199-02F-12 aerator tip in lieu of the standard.

Item C27

WASTE BIN

No work in this Section. Item to be provided by Owner.

Item C28

THREE-COMPARTMENT SINK

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 12 ft., 0 in. by 30 in. by 34 in. high plus 10 in. high splash at wall; 3 in. high raised open roll at front and end; three 21 in. by 27 in. by 12 in. deep integral sink basins; 18 in. by 18 in. by 8 in. deep integral scrap sink

Construction - 14 gauge stainless steel top, basins and splash, stainless steel channel reinforced, eight legs with gussets, adjustable feet, and eight lengths of crossrail. Secure 3 in. off face of wall. Top of splash shall be fitted with integral flat spot for mounting of the pre-rinse fixture. Turn end down into dishwasher and secure with stainless steel machine screws and nuts. Provide the three wash basins each with a lift out, 16 gauge stainless steel cover with all edges flanged down 1 in., corners rounded and welded, provided with two neatly punched thumb holes, and designed to rest on 1/4 in. rod stock supports welded across the basin corners at proper height to provide a flush surface. Provide a hook under the drainboard for hanging the lids when not in use.
Integral scrapping sink shall be provided with a 2 in. by 1/4 in. bar stock rack guide attached to the reinforced splash with stainless steel through bolts. Integral scrapping sink shall be provided with a 2" x 1/4" bar stock rack guide attached to the reinforced splash with stainless steel through bolts. Sink shall be provided with two 16 gauge perforated stainless steel scrapping baskets, 6" deep, on 1/2" high angle legs set back to clear the basin cove, and integral tubular handles flush with counter tops.

Accessories - Provide unit with two splash mounted pot sink faucet sets and three 2 in. lever waste outlets.

WALL SHELF

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 60" x 12" mounted 54" above floor

Construction - Wall shelf shall be fabricated of 16 gauge stainless steel with back and ends raised 1-1/2", front edges of ends angled back, all corners broken, and front turned down 1-1/2", and in 1/2" at 45°. Shelf corners shall be welded, ground and polished. Mount shelf 1" off face of wall with suitable fasteners on 14 gauge stainless steel flag brackets, 48" on center maximum. Flag brackets shall have a web angle of 30° measured from horizontal.

Item C30

HOSE REEL ASSEMBLY

Make - T&S Brass B-7102-U1JXS9E or equal by Fisher or Reel

Craft Size - 12 foot hose, 3/8" ID

Maximum Water Use - 1.07 Gallons per minute

Description - Unit shall be all standard construction with stainless steel open type reel, adjustable bumper, blue hose, B-107-J low flow spray valve, heat resistant spray valve handle, chrome risers, two wall brackets, continuous pressure vacuum breaker with integral check valve, 36" flexible water hose, control valve, and deck type base faucet, designed for wall mounting per plan up 7'-6" measured at the inlet.

Accessories - Provide with G019430-45 stainless steel wall mount swing bracket.

Installation - The hose reel bracket for wall mounted units shall be rotated 90° downward and installed such that it allows the hose to hang straight down and parallel to the wall. Refer to T&S Brass instructions manual page four figure one for further details.

Item C31

WAREWASHER, DOOR-TYPE, VENTLESS

Make - Hobart AM16VLT-BAS (Hot Water Sanitizing) or equal by Champion or Meiko

Power - 53.7 amps - 208/60/3

Maximum Water Use - 0.64 Gallons per

Rack Certification - Unit shall be Energy Star

compliant

Description - Dishwasher shall be door type with extended hood of all standard construction with 40 rack per hour capacity, 16 gauge stainless steel drawn tank, 18 gauge stainless steel chamber, and 12 gauge stainless steel frame and stainless steel feet, ventless energy recovery, touchscreen controls, WiFi connectivity, two stage filtration, pillarless opening, three-sided hood, pumped drain, door lock, timed wash cycles for 1, 2, 4 or 6 minutes, NSF pot and pan rating for 2, 4, and 6 minute cycles, 70°F rise integral electric booster heater, 27" door opening for 18" x 26" sheet pans or 60-quart, spring counterbalanced chamber, X-shaped revolving, interchangeable upper and lower anti-clogging wash arms, revolving, interchangeable upper and lower rinse arms, slanted, self-locating, one-piece scrap screen and, basket system, automatic fill, door actuated start. Pump shall be stainless steel with stainless steel impeller and shaft, fitted with a stainless steel and carbon ceramic seal, capable of 160 gallon per minute flow and self draining. Motor shall be 2 HP, three phase, squirrel cage, induction-run type with inherent thermal protection, grease packed ball bearings, splashproof design, and ventilated.

Accessories - Single point electrical connection, and four plastic racks; two peg, two flat, sheet pan rack.

Provide drain water tempering kit.

Item C32

WATER

FILTER

Make - WaterSpec WS-SSEXT or equal by 3M, Everpure, or Hobart

Description - Unit shall be all standard construction designed for vertical wall mounting per plan and consisting of a mounting bracket, manifold, and filter cartridge with housing. Assembly shall have an operating inlet water temperature range of 35 to 160 degrees Fahrenheit.

Accessories - Provide four spare SS-EXT filter cartridges.

Item C33

CLEAN WARE TABLE

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts, SML Stainless Steel Group, or Julien Inc.

Size - 42" x 30" x 34" high plus 10" splash at walls; 3" high raised roll at front

Construction - 14 gauge stainless steel top and splash over channel frame with raised roll front, tall splash at rear and end, turned down into dishwasher and secured with stainless steel machine screws, and mounted on two legs with gussets, and adjustable feet. Provide a 27" long undershelf welded to table legs at one end and mounted at opposing end on two 10" high legs with gussets, and adjustable feet. Secure table 3" off face of wall.

PART 3 - EXECUTION

3.1 SANITATION REQUIREMENTS

A. Equipment specified herein shall be fabricated to conform to the "Food Service Equipment Standards" of the National Sanitation Foundation prepared by the Committee on Food Service Standards, and published by the National Sanitation Foundation, Ann Arbor, Michigan. Any differences of opinion on sanitation will be referred to the State Department of Health for a ruling.

B. Equipment shall be installed in accordance with the manufacturer's instructions and the best practices of the food service industry, with careful attention to eliminating all cracks, crevices and concealed spaces in wet areas that would be difficult to clean or keep free of vermin and soil.

3.2 EXAMINATION AND ACCEPTANCE

A. Determine whether the General Contractor will furnish and provide temporary power and light, openings and storage space to permit scheduled delivery of equipment. Verify water pressure and provide necessary reducing valves.

B. Examine space in which specified work is to be installed to assure that conditions are satisfactory for the installation of specified work. Report in writing to the Architect, any deficiency in the work of other contractors affecting specified work. Commencement of specified work will be construed as acceptance of space conditions.

C. Obtain and verify all measurements and conditions on the job, and assume responsibility in respect to same.

D. Inspect flooring and raised concrete bases, wall finishes, painting, ceiling installation and all related work for readiness to commence installation of foodservice equipment. Verify the existence of required mechanical and electrical rough-ins.

3.3 CLEANING UP

A. Debris and surplus materials resulting from installation work shall be removed promptly as work progresses, to a location indicated by the General Contractor.

B. Following completion, and before final acceptance by the Owner, clean finished surfaces in accordance with the manufacturer's instructions, and leave specified work free of imperfections.

3.4 DEMONSTRATION AND OPERATING INSTRUCTIONS

A. Before final acceptance, and by appointment with the Owner and his representatives, completely demonstrate with power, the correct operation of each new item of operating equipment.

B. Prior to the demonstration, turn on all mechanical and electrical foodservice equipment. Test for leaks, poor connections, and inadequate or faulty performance and correct if necessary. Adjust for proper operation. Thermostatically controlled equipment and equipment with automatic features shall be operated for a sufficient length of time with proper testing equipment to prove controls are functioning as intended. Recalibrate thermostats if necessary.

C. Provide Architect or Consultant with a loose leaf bound manual of operating data and maintenance instructions containing complete description, wiring diagrams, operating data, maintenance requirements and other information pertaining to the proper operation and upkeep of the various items of electrical or mechanical equipment. Include names, addresses and telephone numbers of authorized service agencies for all items. Arrange all material in alphabetical order by Manufacturer. Provide with a list of equipment to include make, model, and serial number where applicable. Book shall be turned over to Owner after review and approval.

D. Submit guarantees and warranties to the Architect in the above specified manual with all warranty cards completed and becoming effective at the time the equipment was satisfactorily demonstrated.

3.5 PROTECTION OF WORK

A. Protect specified work from damage during transportation to the project site, storage at the site, during installation, and after completion until acceptance by the Owner.

B. Protect adjacent work under other contracts during installation until completion of specified work. After completion, the contractor for other work shall be responsible for the protection of his work until acceptance by the Owner.

C. Damaged work as determined by the Architect, shall be repaired or replaced as determined by the Architect.

END OF SECTION

SECTION 11 66 23
GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted protection pads.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

B. NFPA 101 - Life Safety Code; 2015.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
   1. Fire rating certifications.
   2. Manufacturer's installation instructions.

C. Shop Drawings: For custom fabricated equipment indicate, in large scale detail, construction methods; method of attachment or installation; type and gage of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section; utility requirements as to types, sizes, and locations.

D. Erection Drawings: Detailed dimensional requirements for proper location of equipment.

E. Samples: Submit samples of wall pad coverings in manufacturer's available range of colors.

F. Operating and maintenance data, for each operating equipment item.

G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified with minimum five years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.

B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.

C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. See drawings for sizes and locations, unless noted otherwise.

B. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of Contract Documents.

C. Hardware: Heavy duty steel hardware, as recommended by manufacturer.

2.02 WALL PADDING

A. Wall Padding: Foam filling bonded to backing board, wrapped in covering; each panel fabricated in one piece.
   1. Surface Burning Characteristics: Flame spread index (FSI) of 25 or less, smoke developed index (SDI) of 450 or less, Class A, when tested in accordance with ASTM E84 as a complete panel.
   2. Covering: Vinyl-coated polyester fabric, mildew and rot resistant; stapled to back of board.
      a. Color: As selected from manufacturer's standard range.
      b. Texture: Embossed leather-look.
      c. Fabric Weight: 14 oz/sq yd, minimum.
   3. Foam, Fire-Rated: Open cell polychloroprene (Neoprene), with 5.5 pcf nominal density.
   4. Foam Thickness: 1-1/2 inches.
   5. Backing Board: Plywood.
      a. Thickness: 3/8 inch, minimum.
   6. Mounting: Permanent; using screws.
   7. Manufacturers:
      a. ADP Lemco, Inc: www.adplemco.com/#sle.
      b. Grand Slam Safety, LLC; Wall Padding: www.grandslamsafety.com/#sle.
      c. Draper, Inc; EcoVision Wall Pad: www.draperinc.com/#sle.
      d. IPI by Bison, Inc; Indoor Solid Color Vinyl Padding: www.ipibybison.com/#sle.
      e. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.

B. Inspect areas and conditions before installation, and notify Architect in writing of unsatisfactory or detrimental conditions.

C. Do not proceed with this work until conditions have been corrected; commencing installation constitutes acceptance of work site conditions.

3.02 INSTALLATION

A. Install in accordance with Contract Documents and manufacturer's instructions.

B. Install equipment rigid, straight, plumb, and level.

C. Secure equipment with manufacturer's recommended anchoring devices.

D. Install wall padding securely, with edges tight to wall and without wrinkles in fabric covering.

E. Separate dissimilar metals to prevent electrolytic corrosion.

3.03 ADJUSTING

A. Verify proper placement of equipment.

B. Verify proper placement of equipment anchors and sleeves, and use actual movable equipment to be anchored if available.

3.04 CLEANING

A. Remove masking or protective covering from finished surfaces.

B. Clean equipment in accordance with manufacturer's recommendations.

3.05 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 11 72 00
EXAMINATION AND TREATMENT EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Physical exam equipment.

1.02 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Source quality certificates.
   2. Pre-Installation Manual: Preparation instructions and recommendations.
   3. Installation Manual: Storage and handling requirements and recommendations.
   4. Installation Manual: Installation methods.
   5. Service Manual: Maintenance and operations data.

C. Shop Drawings: Include system components, utility requirements and connections, relationship with adjacent construction. Include required clearances and access for servicing._____

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
   1. See Section 01 60 00 - Product Requirements for additional provisions.
   2. Tools: One each of special tools required for maintenance of equipment.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and applicable codes at the location of the project.

B. Manufacturer Qualifications: Minimum 5 years' experience manufacturing similar products.

C. Installer Qualifications: Minimum 2 years' experience installing similar products.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Each unit of equipment must be placed in a substantial shipping container or crate for safe transportation to final destination. The shipping container or crate for heavy equipment must be on skid construction to facilitate handling by lift equipment.

B. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

C. Properly protect all materials and equipment from injury and damage during storage, installation, and acceptance.

D. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

1.05 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide manufacturer's standard limited warranty.

PART 2 PRODUCTS

2.01 EXAM AND TREATMENT CHAIRS & TABLES

A. Powered Exam & Treatment Tables
   1. Provide a minimum weight capacity of 400 lbs.
   2. Powered lift, tilting, and foot rest must be independently electronically controlled. With maximum 22 inch low access seating height.

3. Base cabinet to have a laminate surface.
    a. Color to be selected by manufacturer's full range.
4. Base legs must be steel frame with baked enamel, powder coat, or epoxy paint finish.
5. A minimum of 2 inches of padding must be provided for patient's comfort.
    a. Color to be selected by manufacturer's full range.
6. The optional accessories must be available:
    a. Integral paper roll compartment to accept 21" x 3.5" standard roll size.
    b. Hand and foot control capability.
    c. Patient restraint straps.
7. Basis of Design: Hausmann Industries, Inc. Hi-Lo Extra Long Trainers Table 4718

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions that may be detrimental to proper or timely completion.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. A. General: Install per manufacturer's written instructions and in proper relationship with adjacent construction.

B. Testing: Test per manufacturer's written instructions. Adjust until satisfactory results are obtained. If satisfactory results cannot be obtained, replace unit at no additional cost to the Owner.

3.03 CLEANING AND PROTECTION

A. Protect from damage during construction operations. Promptly repair any damaged surfaces. Remove and replace work which cannot be satisfactorily repaired.

B. Clean products, prior to Substantial Completion, using materials recommended by the manufacturer.

END OF SECTION

SECTION 11 73 11
PATIENT LIFTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Patient lift equipment with powered operating system and overhead-supported tracks.

1.02 RELATED REQUIREMENTS

A. Section 09 51 00 - Acoustical Ceilings.

1.03 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2018).

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015 (Amended 2017).

C. AISI S400 - North American Standard for Seismic Design of Cold-Formed Steel Structural Systems; 2015, with Supplement (2016).

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

1.04 ADMINISTRATIVE REQUIREMENTS

A. See Section 01 70 00 - Execution and Closeout Requirements for preinstallation meeting requirements.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data sheets of operating system components, track system components, track depth, track maneuverability systems, slings, and accessories. Indicate dimensions, performance requirements, service requirements, materials, finishes, and options

C. Shop Drawings: Indicate dimensions, reflected ceiling plan track layouts, above-ceiling support requirements, attachment-to-support details, point loads, and power-supply connections.

D. Delegated Design Data:
   1. Shop drawings of overhead structural support system signed and sealed by a professional structural engineer.
   2. Calculations for loadings and stresses of cold-formed steel overhead structural support system, signed and sealed by a professional structural engineer.
   3. Details and calculations for factory-made framing connectors, signed and sealed by a professional structural engineer.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

G. Operation Data: Include description of equipment operation and required adjusting and testing.

H. Maintenance Data: Identify system maintenance requirements, servicing cycles, lubrication types required and local spare part sources.

I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design overhead structural support system under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum ten years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with minimum five years of documented experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package equipment to project site in protective packaging.

B. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a three year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design; Savaria M-Series Essential: https://savariapatientcare.com.

B. Patient Lifts:
   1. Savaria M-Series Essential: https://savariapatientcare.com..
   2. Baxter: www.hillrom.com.
   3. Arjo: www.arjo.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 OPERATING SYSTEM

A. Battery-operated patient lift mounted in track system to transfer patients along track system; capable of both powered and manual traverse movement.
   1. Lifting Speed: 0.91 inch/sec.
   2. Features: Overload protection, dual pawl emergency brake system, and emergency down control.
   3. Battery Charging Options: Docking station charging.
   4. Motor-Track Trolley: Component of motor housing for integration with track system.
   5. Hand-control remote control.
   6. Spreader Bar: Spreader bar with four lifting points for sling attachment.

2.03 TRACK SYSTEM

A. Description: Manufacturer's standard track systems capable of varying track configuration layouts:
   1. Track Depth:
      a. Standard Track: 2.31 inches wide by 2.66 inches high ; 650 lbs capacity.
   2. Track Maneuverability Systems:
      a. Single Rail Track System; with 45- and 90-degree bend curved tracks and 650 lbs capacity.
      b. Refer to drawings for layout.

B. Materials:
   1. Track: Extruded aluminum, ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

C. Finish: Powder coated aluminum.

D. Color: Bright white.

2.04 OVERHEAD STRUCTURAL SUPPORT SYSTEM

A. Description:
   1. Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of patient lift overhead support system.
   2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for a complete installation that supports the associated patient lift track and operating systems.

B. Design Criteria: Provide cold-formed steel overhead structural support system.
   1. Structural Performance: Cold-formed structural members and systems capable of withstanding design loads, and in compliance with design reference standards.
   2. Design Reference Standards: Provide system components in compliance with AISI S100 and AISI S240.
      a. Provide system components in compliance with seismic requirements of AISI S400
   3. Design Loads: Provide system components in compliance with applicable codes.

C. Provide classified products, listed and labeled as suitable for intended purpose, where applicable.

D. Channel Materials:
   1. Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum; but not less than thickness required to meet performance requirements.
   2. Size: 1-5/8 inch wide13/16 inch by 13/16 inch high minimum, but not less than size required to meet performance requirements.

2.05 ACCESSORIES

A. Slings: Manufacturer's standard sling with load rating equal to or greater than load rating of lift.

B. Installation Accessories: Provide necessary accessories and closure trim as required for complete installation.

C. Fasteners: Manufacturer's standard inserts, anchors, bolts, rivets, and screws appropriate for project conditions; corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine areas and conditions, with installer present, for compliance with requirements of supporting structural members, installation tolerances, and other conditions that may impact performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions and approved shop drawings.

B. Set components plumb, level, and rigid.

C. Install anchors in accordance with anchor manufacturer's installation guidelines.

D. Interface With Other Work: Use pop rivets or screws to attach L-shaped perimeter moldings of ceiling to lift equipment track.

E. Track System Interface with Finish Ceiling: Install track system relative to finish ceiling for semi-recessed track installation.
   1. Coordinate track system interface with components of Section 09 51 00 - Acoustical Ceilings.

3.03 ADJUSTING

A. Adjust operating equipment for smooth and efficient operation throughout full operating cycle.

3.04 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate operation of equipment to Owner's personnel.

1. Use operation and maintenance data as reference during demonstration.
2. Briefly describe function, operation, and maintenance of each component.

B. Training: Train Owner's personnel on operation and maintenance of system.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.

C. Final Acceptance: Remove labels, fingerprints; clean surfaces. Repair any marred or damaged surfaces that effect appearance in manner not acceptable to Owner. Replace any parts that cannot be repaired in such a manner.

3.05 PROTECTION

A. Protect installed equipment from subsequent construction operations.

3.06 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for service and maintenance of lifts for two years from Date of Substantial Completion.

END OF SECTION

SECTION 12 24 00
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior manual roller shades.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2019.

C. WCMA A100.1 - Safety of Window Covering Products; 2018.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.

B. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
   2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

D. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.

E. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.

F. Selection Samples: Include fabric samples in full range of available colors and patterns.

G. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

H. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

I. Project Record Documents: Record actual locations of control systems and show interconnecting wiring.

J. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

K. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

L. Maintenance contracts.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum five years of documented experience with shading systems of similar size and type.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.08 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Shade Hardware: 25 years.
   2. Fabric: 25 years.
   3. Aluminum and Steel Coatings: One year.
   4. Shade Installation: 2 years

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interior Manually Operated Roller Shades:
   1. Draper, Inc: www.draperinc.com/#sle.
   2. Lutron Electronics Co., Inc; Contract Roller Manual Roller Shades: www.lutron.com/#sle.
   3. MechoShade Systems LLC; Mecho/5 System: www.mechoshade.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 ROLLER SHADES

A. General:
   1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
   2. Provide shade system that operates smoothly when shades are raised or lowered.

B. Roller Shades Type 1 - Basis of Design: MechoShade Systems LLC; Mecho/5 System; www.mechoshade.com/#sle.
   1. Description: Single roller, manually operated fabric window shades.
      a. Drop Position: Regular roll.
      b. Mounting: Ceiling mounted.
      c. Fabric: As indicated under Shade Fabric article.
   2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
   3. Roller Tubes:
      a. Material: Extruded aluminum.
      b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
      c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
      d. Roller tubes to be capable of being removed and reinstalled without affecting roller shade limit adjustments.

4. Hembars: Designed to maintain bottom of shade straight and flat.
   a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
5. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
   a. Provide a permanently lubricated brake assembly mounted on an oil-impregnated hub with wrapped spring clutch.
   b. Brake must withstand minimum pull force of 50 pounds in the stopped position.
   c. Mount clutch/brake assembly on the support brackets, fully independent of the roller tube components.
6. Drive Chain: Continuous loop stainless steel beaded ball chain, 95 pound minimum breaking strength. Provide upper and lower limit stops.
   a. Chain Retainer: Chain tensioning device complying with WCMA A100.1.
7. Accessories:
   a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; clear anodized finish.
      1) Profile: Square.
      2) Configuration: Continuous, fascia extends past continuous bracket.
   b. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

C. Roller Shades Type 2 - Basis of Design: MechoShade Systems LLC; Mecho/5 System; www.mechoshade.com/#sle.
1. Locations: Classrooms and front offices.
2. Description: Double roller, manually operated fabric window shades.
   a. Drop Position: Regular roll.
   b. Mounting: Ceiling mounted.
   c. Size: As indicated on drawings.
   d. Fabric: As indicated under Shade Fabric article.
3. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
   a. Double Roller Brackets: Configured for light-filtering and room-darkening shades in one opening.
      1) Light-Filtering Fabric: Room-side of opening.
      2) Room-Darkening Fabric: Glass-side of opening.
4. Roller Tubes:
   a. Material: Extruded aluminum.
   b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
   c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
   d. Roller tubes to be capable of being removed and reinstalled without affecting roller shade limit adjustments.
5. Hembars: Designed to maintain bottom of shade straight and flat.
   a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
   b. Room-Darkening Shades: Provide a slot in bottom bar with wool-pile light seal.
6. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
   a. Provide a permanently lubricated brake assembly mounted on an oil-impregnated hub with wrapped spring clutch.
   b. Brake must withstand minimum pull force of 50 pounds in the stopped position.
   c. Mount clutch/brake assembly on the support brackets, fully independent of the roller tube components.
7. Drive Chain: Continuous loop stainless steel beaded ball chain, 95 pound minimum breaking strength. Provide upper and lower limit stops.
   a. Chain Retainer: Chain tensioning device complying with WCMA A100.1.

8. Accessories:
    a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; clear anodized finish.
        1) Profile: Square.
    b. Room-Darkening Channels: Extruded aluminum side and center channels with brush pile edge seals, SnapLoc mounting base, and concealed fasteners. Channels to accept one-piece exposed blackout hembar to assure side light control and sill light control.
    c. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

2.03 SHADE FABRIC

A. Fabric for Light-Filtering Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
    1. Manufacturers:
        a. MechoShade Systems LLC; ThermoVeil Basket Weave - 1500 Series (3% open): www.mechoshade.com/#sle.
        b. Substitutions: See Section 01 60 00 - Product Requirements.
    2. Material: Vinyl coated polyester.
    3. Performance Requirements:
        a. Flammability: Pass NFPA 701 large and small tests.
        b. Fungal Resistance: No growth when tested according to ASTM G21.
    4. Openness Factor: 3%.
    5. Color: As selected by Architect from manufacturer’s full range of colors.

B. Fabric for Room-Darkening Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
    1. Manufacturers:
        a. MechoShade Systems LLC; Classic Blackout 0700 Series (opaque): www.mechoshade.com/#sle.
        b. Substitutions: See Section 01 60 00 - Product Requirements.
    2. Material: Vinyl coated polyester.
    3. Performance Requirements:
        a. Flammability: Pass NFPA 701 large and small tests.
        b. Fungal Resistance: No growth when tested according to ASTM G21.
    4. Color: As selected by Architect from manufacturer’s full range of colors.

2.04 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
    1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.
    2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.

C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. Start of installation shall be considered acceptance of substrates.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.

C. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.03 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

C. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

3.04 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

3.05 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

3.06 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner, a proposal as an alternate to the base bid, a separate renewable maintenance contract for the service and maintenance of a motorized shade system for one year from date of Substantial Completion. Include a complete description of preventive maintenance, systematic examination, adjustment, parts and labor, cleaning, and testing, with a detailed schedule.

3.07 SCHEDULE

A. One shade at each window opening (four total), full opening width by full opening height.

END OF SECTION

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SECTION 12 35 53.23
SOLID-PLASTIC LABORATORY CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Standard solid-plastic cabinets and cabinet hardware.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: VOC limitations for adhesives and sealants.

B. Section 07 92 00 - Joint Sealants: Sealing joints between casework and countertops and adjacent walls, floors, and ceilings.

1.03 DEFINITIONS

1.04 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

B. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2018).

C. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement; 2020.

D. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2005 (Reapproved 2010).

E. ASTM D4101 - Standard Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials; 2017, with Editorial Revision (2019).

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

G. SEFA 2 - Installations; 2010.

H. SEFA 3 - Laboratory Work Surfaces; 2010.

I. SEFA 7 - Laboratory Fixtures; 2010.

J. SEFA 8P - Laboratory Grade Polypropylene Casework; 2014.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Details of materials, component dimensions and configurations, construction details, joint details, attachments; manufacturer's catalog literature on hardware and keying, accessories, and service fittings, if any.

C. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements placement dimensions and tolerances, clearances required, and utility locations, if any. Include coordinated information for laboratory equipment specified in another section and/or furnished by Owner.

D. Test Reports: Independent laboratory reports showing compliance with chemical and physical resistance requirements for casework finish.

E. Maintenance Data: Manufacturer's recommendations for care and cleaning.

F. Finish touch-up kit for each type and color of materials provided.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than five years of documented experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. Use polyethylene film or other protective material standard with the manufacturer.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion, at no additional cost to Owner. Defects include, but are not limited to:
   1. Discoloration, or lack of finish integrity.
   2. Heat-welds or any other structural failure.
   3. Failure of hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Solid-Plastic Laboratory Casework:
   1. LabAire Systems, a Division of Activar Plastic Products Group, Inc: www.labairesystems.com/#sle.
   2. LOC Scientific: www.locscientific.com/#sle.
   3. NuAire Inc: www.nuaire.com/#sle.
   4. PolyGuard Scientific, a Division of Aeromat Plastics, Inc: www.polyguardsci.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SOLID-PLASTIC LABORATORY CASEWORK

A. Casework: Solid-plastic, each unit self-contained and not dependent on adjacent units or building structure for rigidity; factory-fabricated, factory-assembled, and factory-finished.
   1. Style: Flush reveal overlay - square edge.
   2. Primary Cabinet Material: Stress-relieved solid polypropylene.
      a. Polypropylene sheets laminated to metal or wood substrates are not acceptable.
      b. Finish: Manufacturer's standard smooth/smooth surface polypropylene sheets and components.
         1) Color: To be selected from manufacturer's full range.
   3. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions.
      a. Upper Cabinets: 14 inch.
   4. Polypropylene Case Components: 1/2 inch thick sheets, and as standard with casework manufacturer.
   5. Structural Performance: In addition to the requirements of SEFA 3, SEFA 7 and SEFA 8P, provide components that safely support the following minimum loads, without deformation or damage:
      a. Hanging Upper Cases: 300 pounds.
   6. Corners and Joints: Without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
   7. Edges and Seams: Smooth. Form counter tops, facing, shelves, and drain boards from continuous sheets of material. Fully seam welded reinforced polypropylene.
   8. Welding: Hot-air, full-seam welding.
   9. Drawers and Doors: Fabricate drawer and door fronts of same materials as cases.
   10. Cabinet Bottoms: Sealed to case body, to contain spills.

2.03 CABINET HARDWARE

A. Manufacturer's standard styles.

B. Locks: On casework drawers and doors, where indicated. Lock with 5 pin cylinder and 2 keys per lock.
   1. Hinged Doors: Cam type lock, 625 finish.

2. Keying: Key locks alike within a space; key each room separately.
3. Master Key System: All locks operable by master key.

C. Label Holders: Manufacturer's standard materials, size, and mounting, for drawer fronts and cabinet doors indicated.

D. Shelves in Cabinets:
1. Adjustment clips PVC to adjust shelf position ½ inch increment.

E. Swinging Doors:
1. Hinges: Polypropylene hardware hinges and pulls attached with polypropylene screws. Minimum of two hinges for doors.
2. Catches: Polyethylene coated magnets embedded in door and frame.
3. Pulls: Polypropylene, recessed 4 inches wide.

2.04 MATERIALS

A. Polypropylene: Sheets and shapes, ASTM D4101.
1. Density: Results when tested in accordance with ASTM D792.
2. Hardness, Shore D: Results when tested in accordance with ASTM D2240.
3. Water Absorption: Results when tested in accordance with ASTM D570.

B. Sealant For Use in Casework Installation:
1. One component, clear silicone base sealant, chemical curing complying with ASTM C920, Type S, Grade NS, Class 25, Use NT, when tested to glass and aluminum, anti-fungus composition.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of support framing and anchors.

B. Verify that service connections are correctly located and of proper characteristics.

3.02 INSTALLATION

A. Perform installation in accordance with manufacturer's instructions and with SEFA 2.

B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.

C. Set casework items plumb and square, securely anchored to building structure, with no distortion.
1. Base Cabinets: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 3/4 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.

D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.

E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
1. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet .
2. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
3. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
4. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

F. Wall Cabinets: Fasten to hanging strips, and/or wall substrates. Fasten each cabinet through back, near top, at not less than 16 inches on center.

G. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.

H. Replace units that are damaged, including those that have damaged finishes.

3.03 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.04 CLEANING

A. Clean casework and other installed surfaces thoroughly.

3.05 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Protect casework and countertops from ongoing construction activities. Prevent installers from standing on or storing tools and materials on casework or countertops.

C. Repair damage that occurs prior to Date of Substantial Completion, including finishes, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION

SECTION 12 36 00
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

1.02 REFERENCE STANDARDS

A. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

B. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

C. PS 1 - Structural Plywood; 2009.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Flat Sheet Thickness: 3/4 inch, minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Manufacturers:
         1) Dupont; _____: www.corian.com/#sle.

2) Formica Corporation: www.formica.com/#sle.
3) Meganite, Inc: www.meganite.com/#sle.
4) Wilsonart: www.wilsonart.com/#sle.

b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
c. Color and Pattern: As selected by Architect from manufacturer's full line.

3. Other Components Thickness: 1/2 inch, minimum.
4. Exposed Edge Treatment: Built up to minimum 1 1/2 inch thick; edge profile as indicated on drawings; use marine edge at sinks.
5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.

2.02 MATERIALS

A. Wood-Based Components:
1. Wood fabricated from old growth timber is not permitted.

B. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

D. Joint Sealant: Mildew-resistant silicone sealant, white.

2.03 ACCESSORIES

A. Fixed Top-Mounted Countertop Support Brackets:
1. Material: Steel.
2. Finish: Manufacturer's standard, factory-applied, textured powder coat.

2.04 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
1. Join lengths of tops using best method recommended by manufacturer.
2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
2. Height: 4 inches, unless otherwise indicated.

C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

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SECTION 13 11 00

SUMMARY OF THE SWIMMING POOL WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, under separate specification by Owner, apply to this Section.

1.02 SUMMARY OF THE WORK

A. Work to be performed under the following Contracts shall consist of all labor, materials, tools, equipment, transportation, supervision, and services necessary for, and incidental to, the construction and completion of the Project titled; and as shown on the Drawings and/or as herein specified, to include all work. The State of Delaware requires Pool Contractors to maintain a Class B or Class A license, if work is not performed under a General Contractor's Class A license.

B. Therapeutic Pool Scope of Work:
   1. The scope of work for the swimming pool (also referred to as 'pool or pools' in these specifications) construction is intended to produce a fully functional and code compliant institutional therapeutic aquatic venue for the John G. Leach School located at 10 Landers Lane, New Castle, DE 19720. The structure is to be constructed by a properly certified General Contractor and a Commercial Swimming Pool Contractor with verifiable references for pneumatically placed concrete swimming pool construction. The design of the pool and support system is intended to produce a low maintenance, long filter run-time performance with minimal outside support.
   2. It should be noted that pools are not totally self-sufficient, and a normal schedule of regular maintenance and upkeep must be established by the building ownership. The design features a pressure regenerative filtration system of sufficient turnover to maintain a fully code compliant aquatic facility. The pool pump is supplied with an independent VFD motor control system to permit adjustment of the flow rates for periods of higher usage or peak demands. Ease of operation, high quality water filtration and sanitation equipment, and aggressive filtration rates with moderate water usage are incorporated to make the day-to-day operation of the pool and its support system as low impact as possible.
   3. Access to the pool filtration equipment is housed in a dedicated pool equipment room within the natatorium structure with all piping trenched below the pool deck to supply the pool with filtered and sanitized pool water. All equipment in the pool filter area is to be rated for indoor/outdoor use and have UL certification for wet applications for all electrical components.

C. Basis of Design, Base Bid:
   1. The Basis of Design for the Base Bid Swimming Pool vessel shall be a pneumatically placed concrete swimming pool of (dry-gun) gunite or (wet-gun) shotcrete placement methodologies incorporating a skimmer-type recirculating system. The Colonial School District reserves the right to select any system that is deemed to be in the best interest of the John G. Leach School.
   2. The Base Bid work associated with the new swimming pool construction is established as an irregular shaped, ADA accessible therapeutic pool, incorporating an ADA ramp, shallow water therapy area, main therapy area, and all required support equipment. (See architectural drawings for all overall dimensions and profiles.) The main pool shall operate at a design temperature ranging from 84 to 86 degrees F.

D. The following items are included in the scope of work for the pool contract, but are not limited to:

E. Coordination of all trade-related work impacting the swimming pool construction and the related filter and sanitation systems and functions. Coordination of all piping runs connecting the pool to control over excavation and filter areas shall be fully defined by this contractor and coordinated to eliminate conflict between pool related equipment and the building mechanical and electrical

systems located under the floor slabs. A Pre-installation meeting is required for all pool-related equipment with all major trades to coordinate and delineate all scope of work of all trades prior to the start of construction.

1. Furnish and install all pool-related piping, filtration, sanitation, control equipment, tie-ins for building interface, if required.
2. Furnish and install all pool automatic water level control systems to fill and maintain proper water level in the pool, from the main building domestic water system (by others).
3. Furnish and install all pool deck anchors indicated on the drawings.
4. Furnish and install all low voltage control wiring for all pumps, starters (VFDs), and controllers from the pool equipment. All line and high voltage from the electrical panel provided by electrical contractor shall be installed under the electrical contract and all line and high voltage wiring shall be installed and connected to all pool equipment by the electrical contractor with oversight and coordination furnished by the pool contractor. All “plug and play” equipment shall be installed by the Pool Contractor.
5. Furnish and install all electrical bonding of all conductive metals within 5 feet of the swimming pool containment vessels per the latest NEC and State of Delaware DOH requirements. This includes the costs for all bonding certification testing.
6. Costs associated with all water required for testing (prior to finish installations) and water for final startup are to be furnished by the pool contractor. (The Owner may elect to furnish water for the initial testing and final fill up, but the cost for same should be identified by the General Contractor, subject to change.)
7. Coordination and costs for all required chemicals for start-up and the first three months of operation. Include owner orientation of up to three full days for a certified pool operator.
8. Securing all required pool water discharge permits from the local jurisdiction and start-up approvals for the pools.

F. Work not included:
   1. Sub-structure drainage to be installed by others.
   2. Water service to the filter room to be installed by others under the Plumbing contract.
   3. Sanitary drainage from the filter room to be installed by others under the Plumbing contract.
   4. Electrical service to the filter room, power wiring and associated electrical panel to be installed by others under the Electrical contract.
   5. Building heating system connections to the filter room to be installed by others under the Mechanical contract.
   6. Exhaust and venting from pool filter room to be installed by others under the Mechanical contract.

G. All swimming pool systems shall be fully coordinated with the building structure to produce a pool structure able to accommodate incidental structural movement. All ceramic tile finish materials at pool perimeter (State of Delaware compliant depth Markings) shall be installed with epoxy-based setting bed and grouting materials to produce a high strength, flexible attachment system with the concrete pool decks and within the containment structure where applicable.

H. All exposed finishes shall be reviewed and approved by the Architect of Record. The pool drawings are furnished to provide the intended scope of work and are consistent with a Bidding and Construction level of completion. These documents are for pricing and construction.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 13 11 13
SWIMMING POOL SHOTCRETE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Refer to Section 13 11 00 - Summary of The Swimming Pool Work for additional information regarding the Work of this Section.

1.02 SUMMARY

A. Section includes shotcrete applied by dry-mix or wet-mix process for the following:
   1. New Pool.

B. Related Sections include the following:
   1. Section 13 11 00 - Summary of the Swimming Pool Work
   2. Section 13 11 26 - Exposed Aggregate Pool Finish
   3. Section 13 11 29 - Ceramic Tile Swimming Pool Finish
   4. Section 13 11 41 - Skimmer Recirculation System

1.03 DEFINITIONS

A. Shotcrete: Mortar or concrete pneumatically projected onto a surface at high velocity.

B. Dry-Mix Shotcrete: Shotcrete with most of the mixing water added at nozzle.

C. Wet-Mix Shotcrete: Shotcrete with ingredients, including mixing water, mixed before introduction into delivery hose.

D. Rebound: Aggregate mixed with some cement, which ricochets off the surface during the application of shotcrete because of collision with the hard surface, reinforcement, or with the aggregate particles themselves, which amount varies with the position of the work, air pressure, cement content, maximum size and grading of aggregate, amount of reinforcing and thickness of layer. Rebound materials may not be reused in any form for shotcrete work and shall never be worked into the construction by the nozzleman.

1.04 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at Project site.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product including reinforcement and forming accessories, shotcrete materials, admixtures, curing compounds and curing blankets.

B. Design Mixtures: For each shotcrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. For pre-dampened dry-mix mixtures, indicate amounts of mixing water to be added to the dry-mix materials before mixing and conveying through the delivery hose.

C. Shop Drawings: For shotcrete installation. Include support and anchor details; reinforcement materials and grades and details of fabricating, bending, and placing reinforcement; number and location of splices; special reinforcement required for openings through shotcrete structures; formwork materials and details of formwork fabrication, assembly, and support; and locations of proposed construction joints.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Certificates: For each of the following:
   1. Cementitious materials.
   2. Admixtures.
   3. Form materials.

C. Preconstruction Test Reports; For Shotcrete.

D. Field quality-control reports.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer employing nozzle operators for the Project, each of whom attains mean core grades not exceeding 2.5, according to ACI 506.2, on preconstruction tests, is ACI Shotcrete Nozzleman certified in Dry-Mix Process for Vertical Position, is ACI Shotcrete certified in Wet-Mix Process for Vertical Position as appropriate to the required shotcrete work.

B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

C. ACI Publications: Comply with ACI 506.2, “Specification for Shotcrete,” unless modified by requirements in the Contract Documents.

D. Shotcrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design shotcrete mixtures.

1.08 PRODUCT HANDLING

A. Protection: Use all means necessary to protect shotcrete materials before, during and after installation and to protect the installed Work specified in other Sections.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

1.09 PRECONSTRUCTION TESTING

A. Submit cured samples showing type of work that can be expected in finish work. It is the General Contractor’s option to use the actual in-place gunite as the required sample. Size to be such for Architect to accurately judge finish product and results.

B. For each day's shooting, the following core test procedure must be followed:
   1. Take a panel board, plywood, or any other suitable material approximately one (1) foot square.
   2. Set this board on the floor of the pool in the area where the nozzle is working and spray on gunite to the thickness of four inches (4") over the entire surface.
   3. When sample has taken its initial set, approximately one (1) hour, gently trim the top and sides of the required 4" thickness; the top surface must be flat and parallel with the bottom surface. On the sides of the panel, scratch an identification number and the date shot.
   4. Upon completion of the days shooting, and when the panel has achieved the maximum set allowable for that day, gently relocate this panel to a safe, damp area. Wet the panel thoroughly; cover it with a wet cloth or wet sand.
   5. Contact independent certified testing laboratory and advise. Then pick up the panels on the fourth or fifth day, transporting them to their laboratory for curing, cutting and testing in accordance with ACI Standard 506-66, Section 320.
   6. Submit test results to Architect before completion of the Project.

1.10 WARRANTY

A. The General Contractor warrants that all materials used in completing the installation contracted for are new and of high quality; that all work has been done in a competent and workmanlike manner; that if any substantial defect occurs in the workmanship or materials, it will be remedied without cost to the Owner if written notice thereof is given to the Contractor within one (1) year from the Date of Substantial Completion. Assemblies or units (such as heaters, pumps, and motors, etc.) and standard fittings or accessories purchased by the Contractor for use in this installation are subject only to the extent of the manufacturer's warrantee.

B. The General Contractor shall warrantee for one (1) year repair of the shotcrete pool structure covering any defects, cracks and/or leaking in the shotcrete pool shell caused by defective workmanship or material, exclusive of damages due to subsurface hydrostatic conditions, provided the pool is kept full of water at all times except for required cleaning and that during

such cleaning the pool does not remain entirely empty for more than a forty-eight (48) hour period.

1.11 PATENTED MATERIAL

A. The General Contractor shall pay all royalties and license fees as applicable. He shall defend all suits or claims for infringement of any patent rights and shall save the Owner and Owner's Architect and his consultants absolutely harmless from loss on account there from.

B. The General Contractor shall not be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified. If the General Contractor has reason to believe that the design, process, or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Owner and the Architect.

PART 2 PRODUCTS

2.01 FORM MATERIALS

A. Forms: Form-facing panels that provide continuous, straight, smooth, concrete surfaces. Furnish panels in largest practical sizes to minimize number of joints.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A615/A 615M, Grade 60 (Grade 420), deformed.

B. Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing bars and welding wire fabric in place; manufactured according to CRSI's "Manual of Standard Practice" and as follows:
   1. For uncoated reinforcement, use all-plastic bar supports
   2. Do not use masonry or stone as supports

C. Reinforcing Anchors: ASTM A 36/A 36M, unheaded rods or ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), hex-head bolts; carbon steel; and carbon steel nuts.
   1. Finish: Plain, uncoated.

D. Steel Wire: ANSI/ASTM A82, as drawn, cold-drawn steel wire.

E. Welded Wire Fabric: ANSI/ASTM A185, welded steel wire fabric.

2.03 SHOTCRETE MATERIALS

A. Source Limitations for Shotcrete: Obtain each color, size, type, and variety of shotcrete material and shotcrete mixture from single manufacturer with resources to provide shotcrete of consistent quality in appearance and physical properties.

B. Portland Cement: ASTM C150, Type I or Type III. Use only one brand and type of cement for project.
   1. Fly Ash: ASTM C 618, Class C or Class F.

C. Normal-Weight Aggregates: ASTM C33, from a single source and as follows:
   1. Combined Aggregate Size: ACI 506R or ASTM C 1436, Grading No. 2 sieve analysis.

D. Water: Potable, complying with ASTM C94/C94M, free from deleterious materials that may affect color stability, setting, or strength of concrete.

E. Ground Wire: High-strength steel wire, 0.8 to 1.0 mm in diameter.

F. Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.04 ADMIXTURES

A. General: ASTM C 1141, Class A (liquid) or Class B (non-liquid) but limited to the following admixture materials. Provide admixtures for shotcrete that contain not more than 0.1 percent chloride ions. Certify compatibility of admixtures with each other and with other cementitious materials.
   1. Accelerating Admixture, Conventional: ASTM C 494/C 494M, Type C or Type E.
   2. Pozzolanic Admixture: Fly ash, ground granulated blast-furnace slag, and silica fume as limited in "Shotcrete Materials" Article.

3. Coloring Admixture: Coloring agent as limited in “Shotcrete Materials” Article.

2.05 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yard (305 g/sq. m) dry, or cotton mats.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable

D. Clear, Waterborne, Membrane-Forming Curing Compound: C309, Type I, Class A, unless other type acceptable to the Architect. Do not apply to exterior surfaces to receive a plaster finish or ceramic tile.

2.06 SHOTCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of shotcrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 506.2.
   1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs-based laboratory trial mixture or field test data, or both.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of Portland cement, which would otherwise be used, by not less than 40 percent.

C. Cementitious Materials: Limit use of fly ash to not exceed in exceed, in combination, 15 percent of Portland cement by weight.

D. Limit water-soluble chloride ions to maximum percentage by weight of cement or cementitious materials permitted by ACI 301.

E. Admixtures: When included in shotcrete design mixtures, use admixtures according to manufacturer’s written instructions.

F. Design-Admixtures: Subject to compliance with requirements, shotcrete design-mixture adjustments may be proposed when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant

2.07 SHOTCRETE MIXTURES

A. Shotcrete Mixture: Proportion mixture to provide shotcrete with the following properties:
   1. Compressive Strength (28 Days): 4000 psi (27.6 MPa).
   2. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight wet-mix shotcrete having an air content before pumping of 8 percent with a tolerance of plus or minus 1-1/2 percent.

2.08 SHOTCRETE EQUIPMENT

A. Mixing Equipment: Capable of thoroughly mixing shotcrete materials in sufficient quantities to maintain continuous placement.

B. Dry-Mix Delivery Equipment: Capable of discharging aggregate-cement mixture into delivery hose under close control and maintaining continuous stream of uniformly mixed materials at required velocity to discharge nozzle. Equip discharge nozzle with manually operated water-injection system for directing even distribution of water to aggregate-cement mixture.
   1. Provide uniform, steady supply of clean, compressed air to maintain constant nozzle velocity while simultaneously operating blow pipe for cleaning away rebound.
   2. Provide water supply with uniform pressure at discharge nozzle to ensure uniform mixing with aggregate-cement mix. Provide water pump to system if line water pressure is inadequate.

C. Wet-Mix Delivery Equipment: Capable of discharging aggregate-cement-water mixture accurately, uniformly, and continuously.

2.09 BATCHING AND MIXING

A. Dry-Mix Process: Measure mixture proportions by weight batching according to ASTM C 94/C 94M or by volume batching complying with ASTM C 685/C 685M requirements.

1. In volume batching, adjust fine-aggregate volume for bulking. Test fine-aggregate moisture content at least once daily to determine extent of bulking.
2. Prepackaged shotcrete materials may be used at Contractor's option. Predampen prepackaged shotcrete materials and mix before use.

B. Wet-Mix Process: Measure, batch, mix, and deliver shotcrete according to ASTM C 94/C 94M and furnish batch ticket information.
1. Comply with ASTM C 685/C 685M when shotcrete ingredients are delivered dry and proportioned and mixed on-site.

2.10 RELATED MATERIALS

A. Latex Bonding Agent: ASTM C 1059/C 1059M, Type II.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following;
a. Latex Bonding Agent, Type II (Non-Redispersible):
1) Dayton Superior Corporation; Conspec Strong Bond.
2) Euclid Chemical Company (The), an RPM company; Flex-Con.
3) W. R. Meadows, Inc.; Sealtight Acry-Lok.
4) Kaufman Products, Inc.; Surebond

2.11 REPAIR MATERIALS

A. Concrete Patching Mortar: Chemical treatment for waterproofing concrete.
1. Xypex Concrete Waterproofing by Crystallization, Xypex Chemical Corporation.
a. Xypex Concentrate.

2.12 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
1. Available Manufacturers:
a. Bometals, Inc.
b. Greenstreak.
c. Meadows, W. R., Inc.
d. Murphy, Paul Plastics Co.
e. Progress Unlimited, Inc.
f. Tamms Industries, Inc.
g. Vinylex Corp.
2. Profile: Ribbed without center bulb.
3. Dimensions: 4 inches by 3/16 inch thick (150 mm by 10 mm thick); nontapered.

B. Non-Expanding Plastic Adhesive Waterstops: Manufactured rectangular or trapezoidal strip, single-component, self-sealing adhesive compound, for adhesive bonding to concrete, 5/8 by 1-1/2 inch.
1. Products: Subject to compliance with requirements, provide the following:
a. Synko-Flex SF302, Henry Company.
1) Synko-Flex SF311 Solvent Based Primer.

C. Expanding Waterstops: Sika Hydrotite 1”x 1/4” expanding hydrophilic waterstop, as manufactured by Sika Corporation, St. Louis, Missouri, or equal.

2.13 DRAINAGE FILL

A. Drainage Course under bottom slabs: Narrowly graded mixture of frost-free, washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

PART 3 EXECUTION

3.01 PREPARATION

A. Concrete: Before applying shotcrete, remove unsound or loose materials and contaminants that may inhibit shotcrete bonding. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch (13 mm) deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces to saturated, surface-dry condition before shotcreting.
   1. Abrasive blast or hydroblast existing surfaces that do not require chipping to remove paint, oil, grease, or other contaminants and to provide roughened surface for proper shotcrete bonding.

B. Earth: Compact and trim to line and grade before placing shotcrete. Do not place shotcrete on frozen surfaces. Dampen surfaces to saturated, surface-dry condition before shotcreting.

C. Rock: Clean rock surfaces of loose materials, mud, and other foreign matter that might weaken shotcrete bonding. Dampen surfaces to saturated, surface-dry condition before shotcreting.

D. Steel: Clean steel surfaces by abrasive blasting according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

3.02 FORMS

A. General: Design, erect, support, brace, and maintain forms, according to ACI 301, to support shotcrete and construction loads and to facilitate shotcreting. Construct forms so shotcrete members and structures are secured to prevent excessive vibration or deflection during shotcreting.
   1. Fabricate forms to be readily removable without impact, shock, or damage to shotcrete surfaces and adjacent materials.
   2. Construct forms to required sizes, shapes, lines, and dimensions using ground wires and depth gages to obtain accurate alignment, location, and grades in finished structures. Construct forms to prevent mortar leakage but permit escape of air and rebound during shotcreting. Provide for openings, offsets, blocking, screeds, anchorages, inserts, and other features required in the Work.

B. Form openings, chases, recesses, bulkheads, keyways, and screeds in formwork. Determine sizes and locations from trades providing such items. Accurately place and securely support items built into forms.

3.03 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that weaken shotcrete bonding.

C. Securely embed reinforcing anchors into existing substrates, located as required.

D. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports, bolsters, chairs, spacers, and other devices as required to maintain minimum concrete cover. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Place reinforcement to obtain at least 3" minimum coverage for concrete protection if placed against gravel and obtain at least 3" minimum coverage for concrete protection if placed against virgin earth (In-Situ material) or chlorinated swimming pool water.

F. After reinforcing has been placed and supported, no wheeling of materials shall be done across steel except over proper runways bearing on forms rather than reinforcing. Displaced reinforcing must be reset and re-supported before applying shotcrete. During shotcrete placement, continuous attention must be given to proper steel placement.

G. Cleaning, bending, placing, and splicing of reinforcement shall be done in accordance with American Concrete Institute Building Code. Minimum lap for spliced bar reinforcing shall be twenty (20) bar diameters.

3.04 WATERSTOPS

A. Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions. Prevent displacement during shotcrete application.

3.05 JOINTS

A. General: Construct joints at locations indicated or as approved by Architect.

B. Construction Joints: Locate and install construction joints tapered to a 1:1 slope where joint is not subject to compression loads and square where joint is perpendicular to main reinforcement. Continue reinforcement through construction joints unless otherwise indicated.

3.06 ALIGNMENT CONTROL

A. Ground Wires: Install ground wires to establish thickness and planes of shotcrete surfaces. Install ground wires at corners and offsets not established by forms. Pull ground wires taut and position adjustment devices to permit additional tightening.

3.07 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by shotcrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.08 APPLICATION

A. Apply temporary protective coverings and protect adjacent surfaces against deposit of rebound and overspray or impact from nozzle stream.

B. Moisten wood forms immediately before placing shotcrete where form coatings are not used.

C. Apply shotcrete according to ACI 506.2.

D. Apply dry-mix shotcrete materials within 45 minutes after predampening and wet-mix shotcrete materials within 90 minutes after batching.

E. Deposit shotcrete continuously in multiple passes, to required thickness, without cold joints and laminations developing. Place shotcrete with nozzle held perpendicular to receiving surface. Begin shotcreting in corners and recesses.

1. Remove and dispose of rebound and overspray materials during shotcreting to maintain clean surfaces and to prevent rebound entrapment.

F. Maintain reinforcement in position during shotcreting. Place shotcrete to completely encase reinforcement and other embedded items. Maintain steel reinforcement free of overspray and prevent buildup against front face during shotcreting.

G. After shotcrete has been placed to desired thickness, all high spots shall be cut off with a sharp trowel or screened to a true plane. Screeds, where used, shall be lightly applied to all surfaces so as not to disturb the shotcrete for an appreciable depth, and they shall be worked in an upward direction when applied on vertical surfaces.

H. Finished concrete shall be true to form indicated on the plans and shall be free from swells, ridges, projections, depressions, holes, cavities, mortar deficiencies, and other defects.

I. After placing, all shotcrete patches shall be sounded, and any indications of sand pockets or hollow areas shall be investigated and repaired. Unless otherwise directed by the Architect, the finished mortar surface shall be given a flash coat, 1/8 inch thick.

J. Special care shall be taken to obtain a slightly rough appearance on all exposed surfaces suitable for the placement of a plaster or ceramic tile swimming pool finish where indicated on drawings

K. Do not place subsequent lifts until previous lift of shotcrete is capable of supporting new shotcrete.

L. Do not permit shotcrete to sag, slough, or dislodge.

M. Remove hardened overspray, rebound, and laitance from shotcrete surfaces to receive additional layers of shotcrete; dampen surfaces before shotcreting.

N. At the end of each day's work, or similar stopping periods requiring construction joints, the mortar shall be sloped off to a thin edge.

O. Do not disturb shotcrete surfaces before beginning finishing operations.

P. Remove ground wires or other alignment-control devices after shotcrete placement.

Q. Shotcrete Core Grade: Apply shotcrete to achieve mean core grades not exceeding 2.5 according to ACI 506.2, with no single core grade exceeding 3.0.

R. Installation Tolerances: Place shotcrete without exceeding installation tolerances permitted by ACI 117, increased by a factor of two.

S. Cold-Weather Shotcreting: Mix, place, and protect shotcrete according to ACI 306.1 and as follows. Protect shotcrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. Discontinue shotcreting when ambient temperature is 40 deg F (4.4 deg C) and falling.
   2. Uniformly heat water and aggregates before mixing to obtain a shotcrete shooting temperature of not less than 50 deg F (10 deg C) and not more than 90 deg F (32 deg C).
   3. Do not use frozen materials or materials containing ice or snow.
   4. Do not place shotcrete on frozen surfaces or surfaces containing frozen materials.
   5. Do not use calcium chloride, salt, or other materials containing antifreeze agents.

T. Hot-Weather Shotcreting: Mix, place, and protect shotcrete according to recommendations of ACI 305R when hot-weather conditions and high temperatures would seriously impair quality and strength of shotcrete, and as follows:
   1. Cool ingredients before mixing to maintain shotcrete temperature at time of placement below 100 deg F (38 deg C) for dry mix or 90 deg F (32 deg C) for wet mix.
   2. Reduce temperature of reinforcing steel and receiving surfaces below 100 deg F (38 deg C) before shotcreting.

3.09 PROTECTION OF ADJACENT SURFACES

A. Contractor shall take every possible precaution to protect adjacent concrete surfaces, equipment, etc., from being damaged by overshooting concrete. Overshot concrete and rebound materials deposited shall be removed at the Contractor's expense.

3.10 SURFACE FINISHES

A. General: Finish shotcrete according to descriptions in ACI 506R.

B. Natural Finishes:
   1. Gun Finish: Natural undisturbed finish as sprayed.
   2. Rod Finish: Rough-textured finish obtained by screeding or cutting exposed face of shotcrete to plane with cutting rod, edge of trowel, or straightedge after initial set. Do not push or float with flat part of trowel.
   3. Broom Finish: Rough-textured finish obtained by screeding or cutting exposed face of shotcrete to plane with cutting rod, edge of trowel, or straightedge after initial set; followed by uniform brooming.

C. Flash-Coat Finish: After screeding or cutting exposed face of shotcrete to plane after initial set, apply up to 1/4-inch (6-mm) coat of shotcrete using ACI 506R, Grading No. 1, fine-screened sand modified with maximum aggregate size not exceeding No. 4 (4.75-mm) sieve to provide a finely textured finish.

D. Flash-Coat with Final Finish: After screeding or cutting exposed face of shotcrete to plane after initial set, apply up to 1/4-inch (6-mm) coat of shotcrete using ACI 506R, Grading No. 1, fine-

screened sand modified with maximum aggregate size not exceeding No. 4 (4.75-mm) sieve, and apply wood-float finish.

3.11 CURING

A. Protect freshly placed shotcrete from premature drying and excessive cold or hot temperatures.

B. Begin curing immediately after placing and finishing but not before free water, if any, has disappeared from shotcrete surface.

C. Curing Exposed Surfaces: Cure shotcrete by one of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Water-saturated absorptive covers or moisture-retaining covers. Lap and seal sides and ends of covers with 12-inch (300-mm) lap over adjacent covers.
   2. Curing Compound: Apply uniformly in continuous operation by power spray according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
      a. Apply curing compound to natural gun finish or flash-coat shotcrete at rate of 1 gal./100 sq. ft. (1 L/2.5 sq. m).

D. Curing Formed Surfaces: Cure formed shotcrete surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

3.12 FORM REMOVAL

A. Forms not supporting weight of shotcrete may be removed after curing for 24 consecutive hours at not less than 50 deg F (10 deg C), provided shotcrete is hard enough not to be damaged by form-removal operations and provided curing and protecting operations are maintained.
   1. Leave forms supporting weight of shotcrete in place until shotcrete has attained design compressive strength. Determine compressive strength of in-place shotcrete by testing representative field-cured specimens of shotcrete.
   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing materials are unacceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to sample materials, visually grade cores, perform tests, and submit reports during shotcreteing.

B. Air Content: ASTM C 173/C 173M, volumetric method or ASTM C 231, pressure method; one test for each compressive-strength test for each mixture of air-entrained, wet-mix shotcrete measured before pumping.

C. Shotcrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.

D. Test Panels: Make a test panel, reinforced as in structure, for each shotcrete mixture and for each workday or for every 50 cu. yd. (38 cu. m) of shotcrete placed, whichever is less. Produce test panels with dimensions of 24 by 24 inches (600 by 600 mm) minimum and of thickness and reinforcing layout of shotcrete work on project. Testing agency will obtain sets of test specimens from each test panel.
   1. Compressive Strength Testing: One set of three unreinforced specimens. Test each set of unreinforced specimens for compressive strength according to ASTM C 1140 and construction testing requirements in ACI 506.2.

2. Visual Core Grading: One set of three reinforced specimens. Visually inspect each set of reinforced shotcrete cores taken from test panels and determine mean core grades according to ACI 506.2.

E. In-Place Shotcrete Testing: Only if samples obtained in item D indicate unsatisfactory shotcrete, and only if directed by Owner, Architect or Engineer, take a set of 3 unreinforced cores for each mix and for each workday or for every 50 cu. yd. (38 cu. m) of shotcrete placed; whichever is less. Do not cut steel reinforcement.

F. Strength of shotcrete will be considered satisfactory according to the following:
1. Specimen Cores: Mean compressive strength of each set of three unreinforced cores equals or exceeds 85 percent of specified compressive strength, with no individual core less than 75 percent of specified compressive strength. Specimen Cubes: Mean compressive strength of each set of three unreinforced cubes shall equal or exceed design compressive strength with no individual cube less than 88 percent of specified compressive strength.

3.14 REPAIRS

A. Cut out, remove and replace, or repair to the satisfaction of the Architect, shotcrete not meeting minimum strength, not true, plumb or level, not to required elevations, containing cracks detrimental to performance or appearance, containing shavings, debris or with honeycombs or voids.

B. Promptly perform Work required to repair, patch, replace, render properly cleaned surfaces (by sandblasting if necessary) or otherwise make good any defective shotcrete at Contractor's expense, including all expense of additional inspection, tests, or supervision made necessary as a result of defective shotcrete.

C. Remove and replace shotcrete that is delaminated or exhibits laminations, voids, or sand/rock pockets exceeding limits for specified core grade of shotcrete.
1. Remove unsound or loose materials and contaminants that may inhibit bond of shotcrete repairs.
2. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch (13 mm) deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders.
3. Dampen surfaces and apply new shotcrete.

D. Repair core holes from in-place testing according to repair provisions in ACI 301, except do not use shotcrete. Match adjacent color and finish.

3.15 CLEANING

A. Immediately remove and dispose of rebound and overspray materials from final shotcrete surfaces and areas not intended for shotcrete placement

3.16 WATER TESTING

A. Upon completion of the proper curing period, the containment vessel shall be water tested to confirm a water-tight structure has been achieved. A full-pool water test shall be maintained for a minimum of 72 hours and the vessel shall be deemed to be watertight after the testing process. Allowances for evaporative loss must be verified based upon air temperature, humidity and any anticipated impact from prevailing winds.

B. The General Contractor shall be responsible for all water required for this test and consult with the Owner for the draining of the pool upon completion of the test. In the event the Owner elects to utilize this test water for irrigation of the existing site, coordination for the pool draining should be coordinated with the General Contractor and the Owner to avoid a negative impact on the Construction Schedule.

END OF SECTION

SECTION 13 11 26

EXPOSED AGGREGATE POOL FINISH (ENHANCED PLASTER)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of pool surfaces.

B. Exposed aggregate pool finish.

C. Pool start-up, including filling, adjusting chemistry, and brushing for specified initial start-up period.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to Section 13 11 00 - Summary of The Swimming Pool Work for additional information regarding the Work of this Section.

1.03 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Selection Samples: Physical color samples showing manufacturer's full selection.

C. Manufacturer's installation instructions.

D. One copy of each of the following, for Owner's use:
   1. National Plasterers Council "Start-Up Do's and Don'ts for Newly Plastered Swimming Pools."
   2. National Plasterers Council "Care Tips for New Swimming Pool Plaster."

E. Submit batch numbers of bags used to Owner for warranty purposes.

1.04 RELATED WORK

A. Shotcrete Construction

B. Interior ceramic tile finish systems

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Experienced in installation of pool plasters and trained by coating manufacturer and shall be a licensed Southern Grout and Mortar Inc. Pool Finish Applicator.

1.06 WARRANTY

A. Provide manufacturer's limited 10-year commercial warranty to pool owner.

B. The pool contractor shall record batch numbers of the plaster bags and provide water sample tests of pool fill water.

C. Krystalkrete Commercial Colors have a 10-year commercial warranty. The base colors are Ivory and all other colors derived from this base color.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Pool Coating: C. L. Industries Inc., PO Box 593704, 8188 South Orange Avenue, Orlando, FL, 32859-3704, Tel. (800) 333-2660, (407) 851-2660, or equal.

2.02 MATERIALS

A. Krystalkrete Exposed Aggregate Pool Finish; Blends of enriched Portland cement with factory-blended crystalline aggregates enhanced with colored quartz.
   1. Color: As selected from manufacturers 10-year warranty color line.

B. Water: Potable water without detrimental minerals, metals, hardness, or alkalinity; if in doubt, verify quality with coating manufacturer. Water shall be clean, fresh potable and free of oils, acids, alkalis and organic matter injurious to a cementitious material.

C. Bonding Coat: C. L. Industries Inc. Permakote

2.03 MIXING

A. Krystalkrete blend shall be mixed in mechanical mixers. Caked or lumped material shall not be used. Re-tempering will not be permitted and Krystalkrete material that has begun to “set” prior to application will be discarded.

B. Mix Proportions:
   1. Using standard mixing equipment, it is important to blend each batch with the same amount of water and to mix each batch for the same amount of time.
   2. Mix Krystalkrete® with approximately 1½ to 1¾ gallons of potable water per 80 lb. bag.
   3. Start the mixing procedure by adding approximately two thirds of the total water requirements to the mixer, add Krystalkrete ® then the balance of water.
   4. Mix the completed batch for at least 8 minutes to ensure a proper blend of all ingredients.
   5. Before using any jobsite additives, please consult your C.L.Industries Product Service Representative.

PART 3 EXECUTION

3.01 PREPARATION

A. Examine pool surfaces to identify conditions that might interfere with proper bonding of coating.
   1. Look for algae, mold, or mildew.
   2. Look for dirt, paint, mortar droppings, patching compounds, loose tile, cracked plaster, etc.
   3. Identify hollow spots in plaster by sounding.

B. Clean pool surfaces of all material that might interfere with proper bonding of coating.
   1. Clean with high pressure water.
   2. Wash oil and grease spots using trisodium phosphate and water, soak if necessary.

C. Stop water penetration from outside pool. Plug cracks and leaks around fittings using hydraulic cement (pool patch). Ardex 8+9 waterproofing membrane is a suitable material for bridging any shrinkage cracks and to stop migration of ground water if any imperfections in the containment structure are encountered.

D. Etch cleaned surface with muriatic acid solution. Use concentration necessary to clean and roughen surface; smooth surfaces may require higher concentration. Neutralize surface with solution of baking soda or soda ash, and water. Thoroughly rinse with water.

E. Plug pool inlets and outlets to prevent clogging.

F. Mark location of fittings using tape on coping or on a measured drawing.

G. Provide sump pump at main drain to remove all running and standing water.

3.02 INSTALLATION

A. Do not begin installation until concrete pool shell has cured at least 28 days.

B. Apply coating in accordance with coating manufacturer's instructions and recommendations.

C. Krystalkrete ® may be applied by either spray or conventional methods. Apply Krystalkrete® over a lightly dampened (no standing water) surface to a uniform thickness of approximately 1/2 inch.

D. The ambient temperature shall be above 40 degrees Fahrenheit 3 days prior to and during application.

E. Care should be taken to protect Krystalkrete® from rapid drying conditions such as high wind, high temperature, low humidity. Such precautions may include fogging or misting the surface or placing a protective covering over the pool. Cover should not be placed on the plaster surface.

3.03 START-UP

A. Filter pool water using a carbon tank and sequestering agent to remove contaminants that might cause staining.

B. wFill pool without interruption of fill water. Fill pool as rapidly as possible. All fill hoses should have a sock or cloth on the end. Do not allow main hose length to lay on the pool surface as it will leave a mark. Start circulation system when water level is above return inlets; circulate water continuously for the first 3 days.

C. Water chemistry should be maintained within +/- 0.3 on the Langelier Saturation Index. Chlorine should not exceed 3 PPM and Cyanuric acid levels should not exceed manufacturers' 40 to 60 PPM recommendations. For more information on chemical balance and the Saturation Index see recommendations from the NPC, National Plasterers' Council, www.npconline.org and APS P, Association of Pool & Spa Professionals, www.theapsp.org. Failure to monitor and maintain proper chemical balance will result in equipment damage as well as surface deterioration. Maintaining proper chemical balance is essential during the initial curing phase as well as routine maintenance to maximize the life of the pool surface.

D. Brush entire coated surface twice a day for the first 3 days. Thereafter, brush entire surface once a day for 2 weeks.

E. Chemistry is for preservation of the finish and additional chemistry for sanitation is recommended. PH and alkalinity MUST be checked and adjusted to the recommended level every other day for the first thirty (30) days.

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SECTION 13 11 29
CERAMIC TILE SWIMMING POOL FINISH

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to Section 13 11 00 - Summary of The Swimming Pool Work for additional information regarding the Work of this Section.

1.02 SUMMARY

A. The extent of ceramic tile finish and related work is indicated on the Drawings, and in general includes, but is not limited to:
   1. Safety stripe.
   2. Swimming pool perimeter band, 8” wide with contrasting tile depth markings.
   3. Stair nosings
   4. Bench edge nosing
   5. Swimming pool beach access

B. The appropriate provisions of the 2016 Tile Council of America (TCA) Handbook for Ceramic Tile Installation (or latest edition). Section P601-09 shall apply and be incorporated in this Section the same as if written out in full herein.

1.03 QUALIFICATIONS OF TILE CONTRACTOR

A. Tile Contractor must have had at least three (3) years’ experience in the construction of the type of swimming pool finish system specified and shall provide a list of at least five (5) pools of this type each with a water surface area of not less than this pool which he has constructed and which upon investigation, would be found to be completed in a satisfactory manner and in operation at least two (2) years.

B. The Tile Contractor's foreman and mechanics must have at least three (3) years’ experience in the installation of setting bed and ceramic mosaic tile finishes on concrete pool decks associated with swimming pool structures. Satisfactory written evidence of such experience shall be presented to the Owner upon request.

C. The ceramic tile installation must be performed by an appropriately skilled Tile Contractor with supervision by the Pool Builder's own personnel. This portion of the work may be subcontracted if all requirements set forth herein are met by the subcontractor and its personnel. The Architect and Aquatic Consultant must be notified if this portion of the work is to be subcontracted.

D. The Owner reserves the right to reject any Tile Contractor if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such Tile Contractor is properly qualified to carry out the obligations of the contract and to complete the work described, or if the Tile Contractor does not meet the qualifications stated herein.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, details and installation instructions for the products used in conjunction with the Swimming Pool.

B. Submit samples of full color line of proposed ceramic tile prior to initiating ceramic tile installation. All colors and layouts must be reviewed and approved by the Architect prior to installation.

1.05 WARRANTY

A. Pool Builder warrants that all materials used in completing the installation contracted for are new and of high quality; that all work has been done in a competent and workmanlike manner; that if any substantial defect occurs in the workmanship or materials it will be remedied without cost to the Owner if written notice thereof is given to the Pool Builder within one (1) year from the Date of Substantial Completion. Assemblies or units (such as deck inserts, ladders, etc.)

and standard fittings or accessories purchased by the Pool Builder for use in this installation are subject only to the extent of the manufacturer's warrantee.

B. The Pool Builder shall warrantee for ten (10) years repair of the Ceramic Tile covering any defects, cracks and/or delamination in the ceramic tile caused by defective workmanship or material, exclusive of damages due to subsurface hydrostatic conditions, provided the pool is kept full of water at all times except for required cleaning and that during such cleaning the pool does not remain entirely empty for more than a ninety-six (96) hour period. The Ardex System one tile setting methodology is the standard for this specification to obtain a 10-year warranty against delamination.

1.06 QUALITY ASSURANCE

A. Pool Builder will be responsible for checking measurements in the field prior to the preparation of Shop Drawings and actual fabrication of the system. Field fitting may be allowed only if measurements will delay the fabrication process.

PART 2 PRODUCTS

2.01 BOND/LEVELING/GAUGING COAT*

A. Ardex AM 100TM Smoothing and Ramping Mortar, 1” to 1-1/4” (thicker application rate permitted by manufacturer provided substrate is examined by the manufacturer prior to installation).

2.02 WATERPROOFING MEMBRANE*

A. Ardex AM 8+9TM Waterproofing and Crack Isolations Membrane, 3 coat application to provide 10 year waterproof warranty.

2.03 INTERIOR SETTING BED*

A. Ardex X77 TM Microtec Fiber Reinforced Thin set mortar. Polymer modified trowel applied thin set setting bed. Install in strict compliance for ceramic mosaic tile in a wet environment.

2.04 GROUT*

A. Ardex FLTM Rapid Set Flexible Grout. Color to be selected by Architect.

2.05 SEALANT*

A. Ardex SX TM 100% Silicone Sealant for Tile and Stone for all areas not in contact with or immersed in pool water. Color to be selected by Architect.

B. Latasil 100% Silicone sealant for all areas of sealant immersed, or in direct contact with pool water.

2.06 CERAMIC TILE

A. Basis-of-Design: Dal-Tile Corporation, 800-993-TILE
   1. Approved equal: American Olean

B. Type: Color body porcelain, floor and wall tile.

C. Size:

D. 1” x 1” x 1/4"

E. Colors:
   1. Color selection by Architect from manufacturer’s full range.

F. Furnish and install all required shapes, coves, caps, and stretchers to provide uniform complete impervious ceramic tile interior swimming pool finish. No rough or sharp edges will be accepted.

PART 3 EXECUTION

3.01 INSTALLATION

A. The ceramic tile finish shall not be applied until:
   1. All work by others in the pool area including finish grade, deck work, exterior painting, etc. have been completed.
   2. Swimming pool has been tested for watertight integrity.

B. Prior to application of finish, the surfaces to be coated shall be thoroughly cleaned of dust, oil, paint, loose materials, and any foreign matter.

C. Trowel setting bed to be thinset and to a smooth, dense, impervious surface. Take extreme care to avoid staining the surface of the finish during troweling operations. Tile to flush with plaster finish.

D. Set ceramic tile as indicated elsewhere in these specifications. All ceramic tiles shall be installed over a floated leveling course of setting bed material to produce a smooth and level installation. All transition areas shall be free of any tripping hazards and produce a smooth level joint between finishes. Install ceramic tile finish in strict compliance with manufacturer's written recommendations. Curing shall be performed in strict compliance with TCA guidelines. Precautions shall be taken during filling pool structure with water to avoid damage to new grouted surfaces caused by direct flow of make-up water. Protective coating can be removed once sufficient depth of water has been reached to avoid damage to grout.

E. Monitor water chemistry to allow for proper curing of grout and ceramic tile. Consult manufacturer for proper pH range, total calcium hardness and total alkalinity during the curing period.

END OF SECTION

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SECTION 13 11 40
POOL TRENCH DRAIN

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to Section 13 11 00 - Summary of The Swimming Pool Work for additional information regarding the Work of this Section.

1.02 SUMMARY

A. A factory fabricated trench drain system consisting of curved stainless steel channel covered by a curved UV protected HDPE grating according to the details shown on the project drawings shall be supplied and installed as a floor drain at beach access. System shall conform exactly to architect's pool plan.

B. Stainless steel drain manufacturer must provide stainless steel certificate showing type of stainless and chemical composition. Stainless certificate will show stainless steel used for manufacturing of this gutter to be purchased from a U.S. owned and U.S. located mill. System shall be manufactured by Paddock Pool Equipment Company, Inc., of Rock Hill, South Carolina, or approved equal.

C. The basis of design for this Project is the Paddock deck drain assembly manufactured by Paddock Pool Equipment Company, Rock Hill, SC. This is a product that is only available from the listed manufacturer. Deviation from the specification is permitted for this component, provided the performance of the substitute product meets the intent of the design.

D. Coordinate all anchors for trench drain with the new tile finish work and corresponding floor slopes.

E. Furnish and install all specified items as indicated in the Drawings and Specifications to provide a complete and fully functioning and operational facility.

F. Provide all necessary supervision, templates, manuals of operation, and turnover instructions.

G. Electrical Contractor shall ground/bond the new trench drain in accordance with the National Electrical Code and all local codes and ordinances.

1.03 SUBMITTALS

A. Manufacturer's Data:

B. Submit six (6) copies of bound Contractor's specifications and installation instructions for products supplied for installation. Include certified laboratory test reports on components as specified or required by regulatory agencies.

C. Assemble information into one (1) coordinated submittal.

D. Shop Drawings:
   1. The Contractor shall prepare shop drawings indicating the materials and size of all equipment to be furnished. Shop drawings to be submitted to Architect for Owner's review/approval.
   2. Submit six (6) copies of bound shop drawings. Show anchors, reinforcement, accessories, grounding lugs, and installation details and methods.
   3. Assemble information into one (1) coordinated submittal.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Basis-of-Design: Paddock Pool Equipment Company, Inc., Rock Hill, South Carolina, or equal.

2.02 MATERIALS

A. Drain Sections:

1. Drain sections shall be fabricated entirely from Type 316L stainless steel. All angle anchors and support brackets shall be stainless steel and pre-fabricated and welded. Grating shall be textured HDPE, 3/4” thick.

B. Drainage Connections:
1. Drain sections with plumbing connections shall have a pre-fabricated stainless steel dropout (throat) centered within the section, 2” in diameter. Pool contractor shall connect 2” pipe to the dropout with a Fernco® connection piece, or similar at discretion of the contractor. Manufacturer shall include a stainless-steel mesh guard to cover every 2” dropout to protect it from debris. Manufacturer shall provide extras for the customer.

C. Drain Channel and Grating
1. Drain channel shall be curved and pre-fabricated. All areas of drain channel shall be accessible for inspection and cleaning. Channel shall be covered by a curved protective grating formed of pre-fabricated, textured HDPE, 3/4” thick, with slots designed to drain water and reduce slipping hazard. Grating shall be identical throughout entire drain system. Grating shall be white unless otherwise specified on plans.

D. Anchorage
1. Manufacturer shall provide adjustable anchoring system to support the deck drain sections, with which the height and level of the drain trough can be field-adjusted by installing contractor. Manufacturer shall provide all coupling support brackets, threaded rods, epoxy, epoxy gun, caulk, and rivets.
2. Entire trench drain system section shall be anchored to concrete pads or strip footings at the contractor’s option with commercial quality threaded rods and leveling nuts installed as shown on plans. Anchor assemblies shall be provided by Paddock placed at every corner elbow and a typical eight-foot on center layout. Every section of drain shall be pre-fabricated to fit within pre-fabricated angle support brackets. Brackets shall be identical in size, and allow for adjusting and leveling in the field. Drain sections shall be caulked into each anchor to form a water-tight seal, and the excess wiped clean from the trough to prevent any pooling within the drain sections.

PART 3 EXECUTION

3.01 INSTALLATION

A. The manufacturer shall coordinate the delivery of all necessary anchors and fittings to the respective contractors in order to avoid any delays in the scheduling of the Project. Contractor shall provide verification within fourteen (14) days of award of Contract that all long lead time items have been ordered. Furnish shop submittals for all specified equipment.

B. The manufacturer shall supply all templates in a timely manner to facilitate a smooth progress of construction. A representative from the manufacturer will be present at the site to supervise the installation of his products, and to allocate a minimum of two (2) working days to supervise the start-up and turnover of the facility as well as instructing the Owner's representatives in the operation and maintenance of all equipment.

C. Install all associated mechanical and electrical work to produce a fully functioning system in compliance with applicable codes and accessibility standards.

D. Installation: All work covered under this section shall be performed by a licensed, qualified and insured installing contractor, or by manufacturer acting as a subcontractor. Contractor responsible for quality of alignment and level of trench drain, and will coordinate placement with GC and A/E.

E. Installation Requirements: (Typical deck drain sections)
1. Trench shall be created wide enough for 12” wide concrete strip footer to be poured, and for contractor to work on the sides. Trench shall be continuous everywhere the drain will be. Plumbing pipe shall connect to pre-fabricated 2” dropouts on drain sections, which are placed as specified in the drawings. Drain ships in standard 8’ sections. Corner elbows shall be pre-fabricated and already welded to their own support brackets.

2. A 2” drain pipe (by others) shall connect to plumbing dropouts using a Fernco® connection, or similar water-tight connection determined by the plumbing contractor. This plumbing will not have a concrete pad beneath it, so supporting the drain pipe is the responsibility of the installer.
3. Drain shall be aligned with a laser or string line, and support coupling brackets (provided) shall be used as templates to drill holes in the concrete pad for the threaded rod. Drill holes and remove debris from the holes before installing threaded rods and epoxy. Once threaded rods are installed, coupling brackets shall be placed on top of leveling nuts on threaded rods as shown on drawings. Adjust as necessary to obtain level throughout the length of drain. Once level, secure bracket position by tightening nuts above the bracket to hold it in place on the threaded rods. Repeat for all sections, ensuring entire deck drain system is level.
4. Each 8’ section of drain will connect to the next by sitting on the support bracket (coupling) as shown in drawings. Caulk to create water-tight seal with the caulk provided, and wipe clean if excess gets into the trough. Once caulked, drill anchoring hole into the trough from the outside through the pre-drilled hole on the support bracket, and pop-rivet the deck drain to the support bracket (coupling). There shall be a total of four (4) rivets per coupling bracket. Repeat for every coupling bracket in the drain system.
5. After the plumbing connections are complete, encase in concrete. Ensure entire system is secured before pouring concrete.

END OF SECTION

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SECTION 13 11 41
SKIMMER RECIRCULATION SYSTEM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to Section 13 11 00 - Summary of The Swimming Pool Work for additional information regarding the Work of this Section.

1.02 SUMMARY

A. The extent of the recirculating system is indicated on the Drawings. This Contractor shall supply and install all anchors, skimmer assemblies, return and suction outlet and inlets, and all piping and hook up to the filtration system.

B. The recirculation system shall include ABS plastic skimmer units complete with float valves, equalizer lines and strainer baskets, directional ABS plastic adjustable filtered water inlets, no leak flanges for all filtered water return inlets, all required Schedule 80 PVC piping, valves, extension keys and all related equipment required for a fully functioning swimming pool recirculation system. All piping shall be installed in strict compliance with the established flow rates, suction and return line velocities and operational perimeters established in the construction documents. All installation techniques shall be performed in compliance with industry standards and all aspects of the skimmer recirculation system shall meet or exceed all requirements of applicable State codes and all Local jurisdictions having authority over the Project.

C. Filtered water return inlets and related imbeds.

D. Hydrotherapy (Water Jet) inlets, required fittings, and related imbeds. (if requested)

1.03 QUALIFICATIONS OF CONTRACTOR

A. The Contractor must have had at least three (3) years experience in the construction of the type of swimming pool recirculating system herein specified and shall provide a list of at least five (5) pools of this type each with a water surface area of not less than this pool which he has constructed and which upon investigation, would be found to be completed in a satisfactory manner and in operation at least two (2) years.

B. The Owner reserves the right to reject any Contractor if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such Contractor is properly qualified to carry out the obligations of the Contract and to complete the work described, or if the Contractor does not meet the qualifications stated herein.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for the product used in this assembly.

B. Where materials or fabrication are indicated, comply with requirements to ensure proper water circulation rate, material properties. Supply complete information to the Architect.

C. Shop Drawings: Submit for each type of recirculating skimmer system. Include sections of typical skimmer with all applicable dimensions. Show anchors, reinforcement, accessories, grounding lugs, and installation details and methods.

1.05 WARRANTY

A. The Contractor warrants that all materials used in completing the installation contracted for are new and of high quality; that all work has been done in a competent and workmanlike manner; that if any substantial defect occurs in the workmanship or materials, it will be remedied without cost to the Owner if written notice thereof is given to the Contractor within one (1) year from the Date of Substantial Completion.

B. The Contractor shall warrant repair of any defective material or repair or correction of improper installation of the recirculation system (exclusive of all valves and interconnecting pipe fittings and the filter chamber) due to defective workmanship or materials not caused by deliberate or abusive action by person(s) not employed by the Contractor or attributable to normal wear and usage. This warranty shall remain in force one (1) year from the Date of Substantial Completion. It is also understood that the entire system must be continuously maintained according to service procedures and directions issued by the manufacturer and that this warranty does not cover damage to the system or its components caused by corrosive or improper water treatment procedures implemented by person other than those employed by the Contractor.

1.06 QUALITY ASSURANCE

A. Field Measurements: The Contractor will be responsible for checking measurements in the field prior to the preparation of Shop Drawings and actual fabrication of the system. Field fitting may be allowed only if measurements will delay the fabrication process.

PART 2 PRODUCTS

2.01 PIPING MATERIAL

A. General: Schedule 80 PVC piping specified throughout the Project for underground piping shall conform to ASTM D 1785, D2241 and D2672.

B. Converter Piping: Swimming pool piping which is used for connection of the filter plant to the skimmer units shall be polyvinyl chloride (PVC) plastic pipe, Type 1-220, Schedule 80 IPS.

C. Fittings for plastic pipe: Wherever PVC plastic pipe is used, all fittings shall be ASTM D 2466 and F438, of the same manufacturer as PVC pipe used by the Contractor. Fit of fittings and pipe shall be proper and capable of developing full strength of the piping system.

D. Skimmer units: Skimmer units shall be Hayward (or equal), Model 1082 FVE Auto-Skim PVC construction, with float valve, equalizer valve and 2” slip fittings suitable for use with schedule 80 PVC interconnecting piping. The skimmer body shall be NSF listed in a white color. Aquastar Flowstar, SKR1401xxx white color with flush face 4” extension, polymer and PVC construction rate from 15 to 90 GPM is an approved equal.

PART 3 EXECUTION

3.01 GENERAL

A. Pipe and accessories shall be handled in such a manner as to insure delivery to the site in sound, undamaged condition.

B. Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Cutting shall be done by means of mechanical cutter.

C. Before installation, pipe and converters shall be inspected for defects. The interior of the pipe shall be thoroughly cleaned of foreign matter and shall be kept clean during laying operation.

D. No installation shall be made that will provide a cross connection or inter-connection between a distributing supply for drinking purposes and the swimming pool that will permit a backflow of water into the pool water system.

E. Pipe openings shall be closed with caps or plugs during installation. Equipment and pool fittings shall be tightly covered and protected against dirt, water and chemical or mechanical injury. At the completion of the work, the fittings, materials, and equipment shall be thoroughly cleaned and adjusted for proper operation.

F. Install all imbeds and finish fittings flush with adjacent finished surfaces. Provide proper exposure of threaded fittings to enable trim rings and associated fittings to be installed in a workman like manner without gaps or irregularities at junction points with the specified pool finish (plaster or ceramic tile). All directional fitting shall be adjusted to provide proper flow of filtered water in each pool vessel and properly tightened upon completion of the work to produce a fully functioning recirculation system.

3.02 JOINTS

A. Mechanical joints: Assemble all mechanical joints by washing the socket and plain ends of the pipe with soapy water. Then the gland and gasket shall be slipped over the plain end in such manner that the small side of the gasket and the lip side of the gland face the socket. The gasket shall then be painted with soapy water. Insert the plain end into the socket and push the gasket into position so that it is evenly seated. Slide the gland into position, insert stainless steel bolts and tighten stainless steel nuts by hand. Using a ratchet wrench, tighten stainless steel bolts alternately bottom and top and continue around pipe until the joint is bottle-tight under all working pressures.

B. Solvent-welded joints: Solvent-welded joints shall be made in accordance with the manufacturer's recommendations. However, the following directions are considered minimum standards. All fittings shall fit easily on the pipe before applying cement. The outer surface area of pipe and inner wall of fitting shall be clean and dry. Thinner is to be applied to the outer surface of the pipe and to the inner surface of the fittings. Cement is to be applied to the outer surface of the pipe, or on the male section of fitting only. When the outside surface area of the pipe end is satisfactorily covered with cement, allow ten (10) seconds open time to elapse before inserting pipe into fittings, turn fitting about the pipe end approximately 1/8 to 1/4 of a turn. Wipe off excess cement at the joint in a neat cover bead. Use only approved cement and thinners for making joints.

C. All joints shall remain completely undisturbed for a minimum of ten (10) minutes from time of joining the pipe and fitting. If necessary to apply pressure to a newly made joint, limit of ten (10) percent of rated pipe pressure, four (4) hours after joining, for the first twenty-four (24) hours after the joint has been made.

D. Carefully handle all pipe and move as little as possible so that the cement seal shall not be broken before it is completely dry and for a time of at least twenty-four (24) hours.

E. Full working pressure shall not be applied until the joints have set for a twenty-four- (24) hour period.

F. Installation during hot weather shall provide for expansion by snaking in ditch or running line on open discharge until it contracts to operating length.

G. Protect plastic pipe from exposure to aromatic hydrocarbons, halogenated hydrocarbons and most of esters and ketones that attack the material. Protect all pipe from mechanical damage and long exposure to sunlight during storage.

H. All connections between PVC and metal pipes must be flanged, plastic flange to metal flange. DO NOT use threaded connections between plastic and metal pipe, except where specifically noted otherwise and in which case the PVC pipe shall be Class 200 weight regardless of size.

3.03 FLUSHING OF LINES

A. All pipe lines leading to the pool shall be thoroughly flushed clean before the pool is filled and placed in use. All gutter chambers shall be thoroughly flushed clean before the pool is filled and placed in use.

3.04 INSPECTION SERVICES

A. The Contractor shall supply the services of a competent and experienced field engineer for a period of at least one (1) day to inspect the completed installation, clean and adjust the skimmers, place the system into operation, and give operative instructions to the Owner's staff relative to its proper care and use.

END OF SECTION

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SECTION 13 11 46
SWIMMING POOL ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Base Bid applies to this Section.

1.02 SUBMITTALS

A. Manufacturer's Data:

B. Submit six (6) copies of bound Contractor's specifications and installation instructions for products supplied for installation. Include certified laboratory test reports on components as specified or required by regulatory agencies.

C. Assemble information into one (1) coordinated submittal.

D. Shop Drawings:
   1. The Contractor shall prepare shop drawings indicating the materials and size of all equipment to be furnished. Shop drawings to be submitted to Architect for Owner's review/approval.
   2. Submit six (6) copies of bound shop drawings for each type of filtration system. Show anchors, reinforcement, accessories, grounding lugs, and installation details and methods. Include piping and wiring diagrams for recirculation, filtration, and chemical treatment systems.
   3. Assemble information into one (1) coordinated submittal.

1.03 SUMMARY

A. Coordinate all anchors for deck equipment with the new tile finish work.

B. Furnish and install all specified items as indicated in the Drawings and Specifications to provide a complete and fully functioning and operational facility.

C. Provide all necessary supervision, templates, manuals of operation, and turnover instructions.

D. Ground/bond the new deck equipment in accordance with the National Electrical Code and all local codes and ordinances.

PART 2 PRODUCTS

2.01 GENERAL

A. Manufacturer: Subject to compliance with requirements, provide products from one of the following:
   1. S.R. Smith, LLC
   2. Keifer Pool Equipment
   3. Spectrum Pool Products
   4. KDI Paragon
   5. Recreonics, Incorporated
   6. Swimtime Lincoln Equipment, Incorporated

B. General Equipment: The following list of specific equipment is provided to establish the overall scope of this Section. Confirm complete list and quantities with schedules on the Architectural Pool Drawings. Not all items are identified herein. Specific mounting equipment, anchors, fasteners, sleeves, etc., shall be furnished with each piece of specified equipment to insure a fully functioning therapeutic aquatic venue.
   1. ADA Swim Lift
   2. Automatic Pool Cleaner – Dolphin Wave 100, as manufactured by Maytronics. Include wireless remote control and deck cart. (Base Bid)
   3. Cleaning Supplies:
      a. Algae Brush

b. All-purpose Brush
c. Aluminum Telescoping Handle
d. Commercial Hose Reel
e. Fireman Type Brass Nozzle
f. Flat Sheet Spray Nozzle
g. Heavy Duty Water Hose
h. Indestructible Squeegee

4. Escutcheon Plates
5. Pool Thermometer
6. Standard Pole Hangers
7. Water Shutoff Petcock
8. Safety Equipment:
   a. Backboard/ Spine Board and Straps
   b. Blood Borne Kit
   c. CPR Mask
   d. Eyewash Kit
   e. First Aid Kit
   f. Head Immobilizer and Adhesive Fastener
   g. Professional Complete Chlorine Test Kit
   h. Protective Apron
   i. PVC Gloves
   j. Rescue Blanket
   k. Rescue tube
   l. Shepherd’s Crook and Pole with “Spring Type” pole Clamps
   m. Signage (pool and deck) - See Schedule
   n. Splash Goggles
   o. Throw Rope
   p. USCG Ring Buoy and Holder

2.02 SPECIFIC PRODUCT LIST

A. See Schedules on Construction Documents for Specific Product list and product quantities.

PART 3 EXECUTION

3.01 INSTALLATION

A. The manufacturer shall coordinate the delivery of all necessary anchors and fittings to the respective contractors to avoid any delays in the scheduling of the Project. Contractor shall provide verification within fourteen (14) days of award of Contract that all long lead time items have been ordered. Furnish shop submittals for all specified equipment.

B. The manufacturer shall supply all templates in a timely manner to facilitate a smooth progress of construction. A representative from the manufacturer will be present at the site to supervise the installation of his products, and to allocate a minimum of two (2) working days to supervise the start up and turnover of the facility as well as instructing the Owner's representatives in the operation and maintenance of all equipment.

C. Install all associated mechanical and electrical work to produce a fully functioning system in compliance with applicable codes and accessibility standards.

END OF SECTION

SECTION 13 15 10
POOL CAULKING AND SEALANTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. SUMMARY
   1. Provide all sealants and caulking including, but not limited to expansion joint filler, and interior caulking.

C. QUALITY ASSURANCE
   1. General sealer performance requirements: Select material for compatibility with joint surfaces and other indicated exposures. Select modulus of elasticity and hardness of grade recommended by manufacturer for each application indicated.
   2. Provide colors as indicated, or if not indicated, color as selected by the Architect from manufacturer's standard colors.

D. SUBMITTALS
   1. Manufacturer's Data:
      a. Submit a PDF copy of manufacturer's specifications and installation instructions for products supplied for installation. Include certified laboratory test reports on components as specified or required by regulatory agencies.
      b. Assemble information into one (1) coordinated submittal.

PART 2 PRODUCTS

2.01 SEALANTS

A. Sealant No. 1 (interior sealant caulk): Sikaflex 1a, as manufactured by Sika Corporation, Lyndhurst, New Jersey For use in filter room if required to seal gaps at piping penetrations

B. Sealant No. 2 (control joint, dissimilar materials, and joints in contact with pool water): Sikaflex 2C-NS, one-part, polyurethane sealant as manufactured by Sika Corporation, Lyndhurst, New Jersey. Color selected by Architect. (for use in vertical and horizontal surfaces)

C. Sealant No. 3 (expandable sealant): Adeka Ultra Seal, P-201 expandable, one part elastic sealant, as manufactured by Asahi Denka Kogyo K.K., Tokyo, Japan. Manufacturer's standard color.

D. Sealant No. 4 (for use at pool skimmer, concrete coping, and ceramic tile edges if tile engages a dissimilar material): Thiokol 2235M as manufactured by Thiokol Corporation, Trenton, New Jersey. Color selected by Architect. Contractor's option for sealants 4 and 5.

E. Sealant No. 5 (for use at pool skimmer, concrete coping, and ceramic tile edges if tile engages swimming pool water): Latasil 100% Silicone sealant as manufactured by Laticrete International, Inc. Bethany, CT. Color selected by Architect. Contractor's option for sealants 4 and 5.

F. Sealant No. 6 (for use in keyways and cold joints): Greenstreak Swellstop 1"x ¾" expanding water stop, as manufactured by Greenstreak, Inc., St. Louis, Missouri.

G. Bond Breaker: 3M 226, 48, 710 as manufactured by 3M Corporation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's printed instruction except where more stringent requirements are specified and except where manufacturer's technical representative directs otherwise.
   1. Elastomeric Sealant Installation Standard: Comply with ASTM C 962.
   2. Solvent-Release-Curing Sealant Installation Standard: Comply with ASTM C 804.
   3. Latex Sealant Installation Standard: Comply with ASTM C 790.
   4. Acoustical Sealant Application Standard: Comply with ASTM C 919 for use of joint sealants in acoustical applications.

5. Installation of Fire-Stopping Sealant: Install sealant, including forming, packing and other accessory materials to fill openings around mechanical and electrical services penetrating floors and walls to provide fire-stops with fire resistance ratings indicated.

B. Do not proceed with installation of liquid sealants under unfavorable weather conditions. Install elastomeric sealants when temperature is in lower third of temperature range recommended by manufacturer for installation.

C. Clean joint surfaces immediately before installation of sealant or caulking compound. Remove dirt, insecure coatings, moisture and other substances which could interfere with bond of sealant or caulking compound. Etch concrete and masonry joint surfaces as recommended by manufacturer. Roughen vitreous and glazed joint surfaces as recommended by manufacturer.

D. Set joint filler units at proper depth or position in joint to coordinate with other work, including installation bond breakers, backer rods and sealants. Do not leave voids or gaps between ends of joint filler units.

E. Install sealant backer rod for liquid elastomeric sealants, except where required by manufacturer's recommendations, to ensure that sealant will perform properly.

F. Install bond breaker tape where indicated and where required by manufacturer's recommendations to ensure that elastomeric sealant will perform properly.

G. Employ only proven installation techniques, which will ensure that sealants are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sites. Except as otherwise indicated, fill sealant rabbit to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and vertical surface, fill joint to form a slight cover, so that joint will not trap moisture and dirt.

H. Install sealant to depths as shown or, if not shown, as recommended by sealant manufacturer but within the following general limitations measured at center (thin) section of bead:
   1. Pool decks, pavements and similar joints sealed with elastomeric sealants, subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75% or joint width, but neither more than 5/8" deep nor less than 3/8" deep.
   2. For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep nor less than 1/4" deep.
   3. For joints sealed with non-elastomeric sealants and caulking compounds, fill joints to a depth in range or 75% to 125% of joint width.

I. Spillage: Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces. Clean adjoining surfaces by whatever means may be necessary, as recommended by manufacturer, to eliminate evidence of spillage.

J. Recess exposed edges of gasket and exposed joint fillers slightly behind adjoining surfaces, unless otherwise shown, so that compressed units will not protrude from joints.

K. Bond ends of gaskets together with adhesive or "weld" by other means as recommended by manufacturer to ensure continuous water-tight and air-tight performance. Miter cut and bond ends at corners unless molded corner units are provided.

3.02 CURE AND PROTECTION

A. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength, and surface durability. Comply with manufacturer's procedures required for cure and protection of joint sealers during construction period, so that they will be without deterioration or damage, (other than normal wear and weathering), at time of Substantial Completion.

END OF SECTION

SECTION 13 15 90
SWIMMING POOL HEATER

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to Section 13 11 00 - Summary of The Swimming Pool Work for additional information regarding the Work of this Section.

1.02 SUMMARY

A. Furnish and install all specified items as indicated in the Drawings and Specifications to provide a complete and fully functioning swimming pool heater system and for domestic water heating of the Pool Building including but not limited to:
   1. Installation supervision, testing and certification.
   2. Labor, material, and equipment to complete the installation.

B. Provide all necessary supervision, templates, manuals of operation, and turnover instructions.

C. Pool Builder shall provide all required piping, fittings, and related recirculation equipment to be connected to the swimming pool heater.

D. Venting system shall be provided and installed by pool builder. Penetrations, fire stopping, and weather proofing shall be by others.

1.03 WARRANTY

A. All work of this Section shall be warranted against all defects of material and/or application for a period of five (5) years from the date of substantial completion (acceptance). Any failures that may occur within this warranty period, due to defective installation and/or materials, shall upon written notification of such failure, be immediately repaired or replaced.

B. Pool builder shall provide owner with one year bi-annual preventive maintenance agreement.

1.04 SUBMITTALS

A. Manufacturer’s Data:
   1. Submit a PDF copy of manufacturer’s specifications and installation instructions for products supplied for installation. Include certified laboratory test reports on components as specified or required by regulatory agencies.
   2. Assemble information into one (1) coordinated submittal.
   3. Include Heater BTU capacity, gas requirements, electrical requirements, clearance requirements, supply/exhaust requirements & configuration, maintenance access, utility requirements.

B. Maintenance Manuals
   1. Include four (4) full maintenance and operating instructions, parts list(s), recommended spare parts and emergency parts inventory, sources of purchase and similar information with the maintenance manual for entire filtration system. Coordinate this data with the information provided by the successful manufacturer of the pool heating system.
   2. Assemble information into one (1) coordinated submittal.

1.05 REGULATORY AGENCY REQUIREMENTS

A. The entire system shall be designed to meet all applicable State and local codes.

B. Nationally recognized standards, as applicable, shall be adhered to.

C. State of Delaware pool heater standards apply. Installation shall be in full compliance for all interconnecting piping.

PART 2 PRODUCTS

2.01 GENERAL DESCRIPTION

A. Heater Manufacturer: Pentair or approved equal.

B. Pool Builder shall verify all elements and quantities as listed on the Drawings and provide required count of each item in order to have a fully functional and operational installation.

C. Items listed on the Drawings include the following elements:
   1. Pool Builder shall furnish a fully functional swimming pool heating system for uses shown on the construction drawings.
   2. Complete installation of swimming pool heater by the Pool Builder. All utility service to the swimming pool heater and electrical service shall be by others.
   3. Complete installation of swimming pool water heating with internal heat exchanger for the Pool Building by the Pool Builder. Refer to Mechanical Drawings.

2.02 SWIMMING POOL WATER HEATER

A. The heater Basis of Design:
   1. Total system volume design is based on 12,663 gallons, 789 SF water surface area. Maximum water temperature 86 degrees F., minimum water temperature 84 degrees F.

B. The Swimming Pool Heater shall be Pentair MasterTemp 200, or equal:
   1. Pool Heater: Pentair direct fire natural gas pool heater Model 200 ASME, having an output rating of 200,000 Btu/hr. and shall be operated on Natural Gas, 84% thermal efficiency.
   2. The water containing section shall be a titanium direct fire heat exchanger year limited warranty against failure caused by defective workmanship or material.
   3. The Pool Heater shall be certified and listed by CSA International under the latest edition of the appropriate ANSI test standard. The Pool Heater shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard. The Pool Heater shall operate at a thermal efficiency of up to 84%.

C. The Pool Heater shall be furnished with an integral by pass assembly to ensure proper operation without condensation. The bypass assembly shall be internally mounted inside the polymer front header. The bypass assembly shall be constructed with all corrosion resistant materials for long life. The by-pass shall automatically control water flow rates through the heat exchanger to maximize efficiency and prevent sweat and condensate problems. No auxiliary by-pass shall be required unless water flow rates exceed 120 GPM.

D. Standard operating controls shall include a digital electronic thermostat with independent settings for either pool or spa temperature control. The electronic temperature control shall ensure accurate temperature control to 1°F. A pool water safety high limit control shall be provided. The temperature controls shall be factory installed and weather proof. Adjustment of the temperature control shall be made without tools or the removal of any jacket panels. The pool heater shall have a master on/off switch inside the jacket enclosure.

E. The Pool Heater shall operate on 120 VAC, 60 cycle. The standard control system shall include a direct-spark ignition system. The ignition system shall provide flame supervision for 100% safety shutdown. The Pool Heater shall be equipped with a 2-line, 16-character digital display to provide the status of operation and troubleshooting assistance on a control sensed malfunction.

F. The Pool Heater shall have an independent laboratory rating for Oxides of Nitrogen (NOx) of less than 30 ppm corrected to 3% O2.

G. The Pool Heater shall be provided with the following venting system:
   1. Installed indoors with an optional venting kit to allow the pool heater's internal combustion blower to exhaust flue products to the rood deck using a sealed Category IV vent pipe and an additional sealed air inlet pipe to draw combustion air from the exterior.

H. The entire Pool Heater shall be furnished with a 3 Year Limited Warranty. This warranty shall provide three years of protection on the heat exchanger and two full years on all other components.

I. Maximum unit dimensions shall be Length 21 inches, Width 23 inches, and Height 29 inches. The unit weight shall be 128 pounds.

PART 3 EXECUTION

3.01 GENERAL

A. The pool heating contractor shall facilitate smooth construction progress by supplying all templates to the Pool Builder in a timely manner. A representative from the Manufacturer / pool heating contractor, whose cost shall be the responsibility of the Pool Builder, will be present at the site to supervise the installation of his products, and to allocate a minimum of two (2) working days to supervise the startup and turnover of the facility as well as instructing the Owner's representatives in the operation and maintenance of all equipment.

B. Prior to installation of the work of this Section, carefully inspect the installed work of other trades and verify that all such work is complete to the point where this installation may properly commence.

C. Fabrication and Installation:
   1. Fabricate and install swimming pool heating system tie-in connections in strict accordance with the manufacturer’s written instructions, reviewed Shop Drawings and applicable referenced standards.
   2. Provide all required supports and anchors to support the connection piping from surrounding structures. See drawings for exact location and mounting height.

D. Clean Up:
   1. Upon completion of the work of this Section, immediately remove all debris and rubbish occasioned by this work to the approval of the Architect and the Owner and at no additional cost to the Owner.

E. Heater Base:
   1. Install heater base in accordance with manufacturer’s instructions and securely fasten as recommended. Bearing shall be completely on structural floor; bridging over openings is prohibited.

END OF SECTION

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SECTION 13 34 13
GLAZED STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-engineered greenhouses.

B. Accessories.

C. Glass and glazing.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete for foundations and slabs.

B. Section 04 20 00 - Unit Masonry

C. Section 07 92 00 - Joint Sealants: Sealing joints between glazed structures and adjacent construction.

1.03 DEFINITIONS

A. Greenhouse: A glazed enclosure described by the following criteria:
   1. Commercial use or detached from other structures.
   2. Exclusively for growing plants.

1.04 REFERENCE STANDARDS

A. American Welding Society (AWS): Structural Welding Code.

B. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

E. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.

F. AAMA AG-13 - AAMA Glossary; 2013.

G. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2020.

H. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).

I. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

J. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

K. ASTM E547 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference; 2000 (Reapproved 2016).

L. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes; 2017.

M. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

N. IGMA TB-3001 - Guidelines for Sloped Glazing; 2001.

O. Glass Association of North America (GANA): Glazing manual.

P. National Accreditation and Management Institute, Inc. (NAMI).

Q. National Glass Association (NGA).

R. G. National Greenhouse Manufacturer's Association (NGMA).

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate installation of glazed structure with size, location, and installation of foundations and service utilities.
   1. Cooperate with regulatory agency or authority and provide data as requested.

B. Preinstallation Meeting: Conduct preinstallation meeting one week prior to start of work of this section; require attendance by every affected installer.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Manufacturer's data sheets on each product to be used.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Typical installation methods.

C. Shop Drawings: Detailed drawings prepared specifically for the project by manufacturer. Include information not fully detailed in manufacturer's standard product data, including, but not limited to wall elevations and detail sections of every typical composite member.
   1. Show opening dimensions, framed opening tolerances, profiles, product components, anchorages, and accessories.
   2. Include details of materials, construction, finish, fastener locations, glazing, hardware arrangements and relationship with adjacent construction.
   3. Include schedule identifying each unit, with marks or numbers referencing Drawings.
   4. Show surrounding substrates and relevant conditions.

D. Maintenance Manuals: Manufacturer's maintenance manuals.

E. Samples:
   1. Metal Finish Selection: Two for color selection of framing members, representing manufacturer's standard range.
   2. Shading Fabric: Two of each type.

F. Design Documents:
   1. Comply with applicable code for submission of design calculations required by authority having jurisdiction for securing permits.

G. Manufacturer's Instructions:
   1. Storage and handling requirements and recommendations.
   2. Preparation instructions and recommendations.
   3. Installation methods.

H. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.07 QUALITY ASSURANCE

A. Designer Qualifications: Perform structural design under direct supervision of Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least ten years of documented experience.
   1. Member in good standing of National Greenhouse Manufacturers Association (NGMA) and National Sunroom Association (NSA).

1.08 MOCK-UP

A. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.

1. Intent of mock-up is to demonstrate surface preparation techniques, quality of workmanship and visual appearance.
2. Approximate Size: 2 x 2 ft (610 x 610 mm).
3. Refinish mock-up area as required to produce acceptable work.
4. Do not continue with remaining work until workmanship, color, and sheen are approved by Architect.
5. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
6. Do not alter or remove mock-up until work is completed or removal is authorized.
7. Retain mock-up during construction as standard for comparison with completed work.
8. Incorporate accepted mock-up as part of the Work.

B. See Section 01 40 00 - Quality Requirements for additional requirements.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in manufacturer's original packaging with manufacturer's name and product identification intact and legible.

B. Store products in manufacturer’s original unopened packaging, covered to protect from weather, damage, precipitation, and construction dirt until ready for installation.

1.10 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimal installation results.

B. Do not install products under environmental conditions outside manufacturer’s absolute limits.

C. Perform structural silicone sealant work when air temperature is between 40 - 120 degrees F (4 - 49 degrees C).

1.11 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within five year period after Date of Substantial Completion.

C. Provide extended warranty period for the following components:
   1. Aluminum Framing Finishes. Provide framing system manufacturer's standard warranty for finish type selected.
      a. For AAMA 611 Class I and II anodized finishes, provide warranty of five years.
      b. For stock color AAMA 2605 finishes, provide organic coating manufacturer’s warranty for color and film integrity for minimum of 15 years from date of application.
      c. For custom color AAMA 2605 finishes, provide organic coating manufacturer’s warranty for color and film integrity for minimum of 15 years from date of application.
   2. Glazing: Provide glazing manufacturer’s standard warranty against defective materials, delamination, seal failure, and other defects in manufacturing.
      a. Glass Units: Provide 20 year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Greenhouses:
   1. Basis of Design: Solar Innovations; Series S15000: https://solarinnovations.com
   2. Janco Greenhouses: https://jancogreenhouse.com/.
   3. Nexus Corporation, a Gibraltar Industries company: www.nexuscorp.com/#sle.
   4. Or A/E approved equal.

2.02 GLAZED STRUCTURE APPLICATIONS

A. Installation: Free-standing.
   1. Foundation Condition: New masonry knee wall.

B. Greenhouse:

1. Dimensions:
   a. Width: 15 ft.
   b. Length: 28 ft 2 in.
   c. Ridge Height: _____.
2. Eave Height: 8 ft 2 in.
3. Eaves: Straight eave.
4. Roof Shape: Gable, straight eave, single-bay.
   a. Roof Slope: 6/12.
5. Drainage: Overlapping construction creates positive drainage within profiles.
6. Framing: Coated aluminum.
7. Wall System: Coated aluminum framing with glazing type IG-1 - insulating glass units.
8. Roof System: Coated aluminum framing with glazing type IG-1 - insulating glass units.
9. Sills: Standard sills.
10. Layout: As indicated on drawings.

2.03 DESIGN CRITERIA

A. Design structural framing that is capable of transferring moments and forces into foundations. Framing members to be considered include rafters, purlins, and vertical mullions. Use design loads stipulated by applicable building code requirements.

B. Perform work in accordance with AAMA/NSA 2100.

2.04 PERFORMANCE CRITERIA

A. Greenhouse Glazing:
   1. Perform glazing in accordance with GANA (GM) for glazing installation methods.
   2. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated, determined with the following procedures and/or test methods:
      a. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
      b. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
      c. Solar Optical Properties: Comply with NFRC 300 test method.
   3. Air and Water Leakage: Leakage measured at differential test pressure amounting to 20 percent of specified strength performance pressure required with operable windows, doors, or joints (if any) sealed during testing procedure.
      a. Air Leakage: Not to exceed 0.18 cfm/sq ft of glazed enclosure, when tested in accordance with ASTM E283/E283M.
      b. Significant Air Leakage: No more than 0.30 cfm per sq ft (91.4 L per min per sq m) projected area of module, determined by ASTM E283.
         1) Supply certified testing reports adhering to the requirements set forth by ASTM E283 at the required pressure of 1.57 psf (75 Pa).
         2) Supply certified testing reports adhering to the requirements set forth by ASTM E283 at the required pressure of 6.24 psf (300 Pa).
      c. Significant Water Leakage: Any uncontrolled penetration of water, determined by ASTM E331; at test pressure equal to 15 percent of positive wind pressure design, but not less than 6 psf (287 Pa),
   4. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.
   5. Structural Performance: No glazing material breakage or permanent damage to fasteners, anchors, hardware, or actuating mechanisms, when tested in accordance with ASTM E330/E330M.
      a. Wind Loads: Test in accordance with ASTM E330/E330M, using loads 1.5 times specified design pressures and 10 second duration of maximum load.
      b. Design Pressure (DP): In accordance with applicable codes.
      c. Normal Wall Deflection Limit: Not to exceed 1/175 of clear span for span lengths of 13 feet 6 inches or less and 1/240 plus 1/4 inch for others.

1) Restrict deflection to 3/4 inch maximum for individual glazing lites.

d. Parallel to wall deflection not exceeding 75 percent of glass edge clearance. Restrict deflection to L/360 or 1/8 inch (3 mm) maximum. Restrict deflection to 1/16 inch (1.6 mm) maximum above doors and/or windows. Increasing the deflection to 1/8 inch (3 mm) to be permitted if the door operation is not affected.

e. Concentrated Load: Design to withstand 250 lb concentrated load at any location on framing members without permanent set.

f. Deflection of the entire assembly, including, but not limited to, glass, not to exceed 1-1/2 inches (38 mm).

g. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, tested by independent agency in accordance with ASTM E1996 for Wind Zone 2 - Enhanced Protection for large and small missile impact and pressure cycling at design wind pressure.

h. Thermal Movement: Design system to accommodate thermal expansion and contraction over ambient temperature range of 100 degrees F, dynamic loading and release of loads, creep of concrete structural members and deflection of structural support framing without damage to system components or loss of weathertightness.

2.05 COMPONENTS

A. Framing System: Manufacturer's standard for indicated roof shape and bay width, using coated aluminum for primary and secondary structural members.
   1. Thickness of framing members based on design loading, cross sectional configuration, and fabrication requirement.
   2. Use extrusions with integral condensation collection and guttering system thermally separated from exterior pressure bar.
   3. Framing Size: 2 x 4 inches (50 x 71 mm), not including glazing depth.
   4. Framing Member Cross Section: As required to accomplish performance criteria.
   5. Sills: Standard sills.
   6. Basic Mullion and Purlin Design: Uniform bay widths; dimension as recommended by manufacturer.

B. Glazing Systems: Pressure glazing bar system.
   1. Double Glazing: Double-pane glass units with sealed edges.
      a. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
         1) Space between lites filled with air.
         2) Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
            (a) Tint: Clear.
            (b) Coating: Self-cleaning type, on #1 surface.
            (c) Coating: Low-E (passive type), on #2 surface.
         3) Inboard Lite: Laminated float glass, 1/4 inch thick, minimum.
            (a) Tint: Clear.
         4) Total Thickness: 1 inch.
         5) Glazing Method: Dry glazing method, gasket glazing.
      b. Type IG-2 - Insulating Glass Units: Sloped glazing, laminated; IGMA TB-3001.
         1) Applications: Exterior sloped glazing at 15 degrees or more from vertical, unless otherwise indicated.
         2) Space between lites filled with air.
         3) Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
            (a) Tint: Clear.
            (b) Coating: Self-cleaning type, on #1 surface.
         4) Laminated Inboard Lite, Outer Pane: Annealed float glass, 1/4 inch thick, minimum.
            (a) Tint: Clear.
         5) Laminated Inboard Lite, Inner Pane: Annealed float glass, 1/4 inch thick, minimum.
            (a) Tint: Clear.

6) Total Thickness: 1 inch.
7) Glazing Method: Design Compression type, replaceable, EPDM gaskets; with solid strand cord to prevent shrinkage.

C. Flashings and Closures: Manufacturer's standard for specified system.

D. Doors: Personnel doors, with frames compatible with, and integrated into glazed structure framing system.
1. Main Personnel Entry Doors: Pair, design indicated on drawings.
2. Panel Size (WxH): 36 x 84 inches.
3. Framing Members: Minimum 0.125 inch(3 mm) wall thickness for structural members.
a. G2 standard thermal extruded aluminum frame with a thermal isolation separation 2.75 inch (69.85 mm) width.
4. Perimeter Weather Gaskets: EPDM.
5. Sill:
a. ADA sill (In-swing and Out-swing) limited air and water performance.
6. Hardware:
a. Handles and Lock Sets:
1) Door Closer
2) Commercial Exterior Entry Trim
3) Mortise Panic Hardware
4) Concealed Locking Rods: Stainless steel. Aluminum is not acceptable
5) Surface Mount 7-Knuckle Hinge: Corrosion proof aluminum hinge with stainless steel bushings and security bolt end.
(a) Zinc- die-cast hinges are not acceptable.
b. Corners: Corner lugs to be extruded, thermally broken aluminum.
1) Non-thermally broken corner connectors are not acceptable.
c. End Caps: Not permitted to breach thermal break.
7.

E. Windows: Manufacturer's standard units, compatible with, and integrated into framing system.
1. Type: Awning.
2. Construction: Manufacturer's standard.
3. Glazing: Matching wall glazing.
4. Size: As indicated on drawings.

2.06 GREENHOUSE OPERATIONS EQUIPMENT

A. Ventilation:
1. Eave and Ridge Vent Operators:
a. Arm and Rod operators
2. Exhaust Fans: Supply and mount exhaust fans as shown on approved greenhouse Shop Drawings.
a. Size and Location: Determined by the professional opinion of the greenhouse manufacturer and is to be shown on approved greenhouse Shop Drawings.
3. Air Intake Shutters:
a. Size: Matched to required exhaust fans.

B. Heating:
1. Natural Gas or LP Heaters: Gas heater to be manufactured by Modine or greenhouse manufacturer approved equal. Gas heater to be sized and located by greenhouse manufacturer and represented on approved greenhouse Shop Drawings.

C. Shading Systems:
1. Vertical or Sloped Shade System:
a. Greenhouse shading system to be manufactured with Phifer Shearweave Solar shades or greenhouse manufacturer approved equal.
b. Coordinate wiring with building electrical service.
2. Horizontal Shade System:

a. Greenhouse shading system to be manufactured with Phifer Shearweave Solar shades or greenhouse manufacturer approved equal.
b. Coordinate wiring with building electrical service.

D. Lighting:
1. Grow Lights:
a. Designed to provide adequate lighting for approved greenhouse bench layout.
b. Switchable ballast for both metal halide and high pressure sodium bulb units.
c. Mounted and located by greenhouse manufacturer.
d. Shown on approved greenhouse Shop Drawings.
e. Outfitted with molded plugs.
f. Coordinate wiring of lighting circuit with.
2. Task Lights: By others, coordinate with building electrical service.

E. Watering Systems:
1. Drip Irrigation:
a. Bench mounted drip irrigation system manufactured by Dramm, Phytotronics or greenhouse manufacturer approved equal.
b. System provides adequate drippers and punch tool to install future drippers to be supplied with system.
c. Installed drippers outfitted with a shut-off mechanism for the individual nozzles.
d. Coordinate plumbing and wiring with other trades.
2. Misting Irrigation:
a. Bench mounted misting irrigation system manufactured by Dramm, Phytotronics or greenhouse manufacturer approved equal.
b. System provides adequate coverage for bench area.
c. Coordinate plumbing and wiring with other trades.

F. Environmental Control System:
1. Supply and mount a fully-functional control system with electrical control cabinets built specifically for the greenhouse based on the approved greenhouse Shop Drawings.
2. Capable of controlling each zone independently using interior zone data and/or exterior data supplied by a weather station included in the control system.
3. Includes PC interface software package.
4. Includes complete electrical drawings and prints for final hook-up.
5. Represented on the approved Shop Drawings for system mounting location.
6. Mounting of sensors and weather station to be the responsibility of greenhouse manufacturer.
7. Coordinate wiring of control system, sensors, and weather station with building electrical service.
8. One day of training and on site commissioning to be completed by the control system manufacturer.

G. Greenhouse Benches:
1. Manufacturer of greenhouse also to be manufacturer of greenhouse bench system.
2. Greenhouse benches to be shown on approved greenhouse Shop Drawings.
3. Greenhouse bench layout to be coordinated between greenhouse manufacturer and Architect for final approval.

2.07 MATERIALS

A. Aluminum Extrusions: Alloy and temper 6063-T5, 6063-T6, or 6061-T6 members complying with ASTM B221 (ASTM B221M), with minimum thickness 1/8 inch for structural members and 1/16 inch for nonstructural members.

B. Internal Reinforcing for Aluminum Framing Members:
1. Structural Aluminum: ASTM B308/B308M.
2. Shapes and sizes based on structural calculations to suit installation.

C. Thermal Insulbar Separation: Manufacturer's standard system to provide thermal separation between exterior and interior components.

D. Glazing Gaskets: Compression-type design, replaceable, EPDM, complying with ASTM C864 requirements.
   1. Compatible with glazing sealant.
   2. Profile and hardness as required to maintain uniform pressure for watertight seal.
   3. Color: Black.

E. Flashings: Metal and finish matching system framing components, with thickness as recommended by manufacturer for conditions encountered.
   1. Secured using concealed fastening method.

F. Glazing Setting Blocks, Edge Blocks, and Spacers: Manufacturer's standard, compatible with glazing type.

G. Weatherseal Sealant: Silicone, with adhesion complying with ASTM C794; compatible with glazing accessories.

H. Anchors and Fasteners: Recommended by manufacturer.

2.08 FABRICATION

A. Perform major fabrication tasks at manufacturing location and not on site.

B. Remove burrs and rough edges on metal items prior to finish application.

C. Install gaskets and glazing tapes at factory to greatest extent possible.

D. Disassemble glazed structure only to extent necessary due to shipping and handling limitations.

E. Manufacturer is to be notified of any field modification prior to the activity commencing.

F. Weld aluminum members in accordance with AWS D1.2/D1.2M.

G. Use isolation membrane materials to separate dissimilar metals to prevent galvanic corrosion/action between materials.

H. Fabricate components to allow for accurate and rigid fit of joints and corners. Match components carefully ensuring continuity of line and design. Ensure joints and connections will be flush and weather tight. Ensure slip joints make full, tight contact and are weathertight.

I. Fabricate components to allow for expansion and contraction with minimum clearance and shim spacing around perimeter of assembly.

J. Drain to exterior any water entering exterior joints, condensation occurring in glazing channels, or migrating moisture occurring within system.

K. Prepare components to receive concealed anchorage devices, and ensure that fasteners will be concealed upon completion of installation.

L. Adhere glass to glazing frames with structural adhesive and cure under controlled conditions in shop. Field glazing of frames to glass is not acceptable.

2.09 FINISHES

A. Aluminum Finishes:
   1. Superior Performing Organic Coatings: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.

2.10 ACCESSORIES

A. Insect Screens:
   1. Framing: Aluminum, 1 x 1 inch (25 x 25 mm).
   2. Screen Materials: Standard gray colored charcoal.
   3. Provide screen at operable windows.
   4. Size: As indicated on the Drawings.
   5. Mounting and Configuration: As indicated on Drawings.

PART 3 EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Prepare substrates in strict accordance with the approved Shop Drawings, using the methods recommended by the manufacturer for achieving best result for the substrates under project conditions. Thoroughly clean surfaces and substrates prior to installation.

B. Do not proceed with installation until substrates have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

C. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

3.02 GLAZED STRUCTURE AND ENVELOPE INSTALLATION

A. Install in accordance with shop drawings and manufacturer’s instruction and installation manual(s).

B. Separate dissimilar materials using nonconductive tape, paint, or other material not visible in finished work.

C. Provide attachments and shims to permanently fasten system to building structure.

D. Maintain dimensional tolerances and alignment with adjacent work.

E. Anchor securely in place, allowing for required movement, including expansion and contraction.

F. Install glazing sealants, including surface preparation in accordance with manufacturer’s instructions and best industry practices.

G. Set sill members in bed of sealant. Set other members with internal sealants to provide weather tight construction.

H. Install flashings, bent metal closures, corners, gutters, and other accessories as required or detailed.

I. Clean surfaces and install weather-barrier sealants in accordance with sealant manufacturer’s instructions and guidelines.

3.03 TESTING

A. Greenhouse installer to complete a water test to the AAMA 501.2 standard with AAMA standard equipment with Architect or general Contractor in presence.

3.04 ADJUSTING AND CLEANING

A. Adjust hinge set, locksets, and other hardware for proper operation. Lubricate using a manufacturer approved lubricant compatible with frame coatings.

B. Remove temporary coverings and protection of adjacent work areas.

C. Repair or replace damaged installed products.

D. Clean installed products in accordance with manufacturer's instructions before owner's acceptance.

E. Any abraded surface of the finish shall be cleaned and touched up with air dry paint, as approved and furnished by the window manufacture, in a color to match factory applied finish.

F. Remove from project site, and legally dispose of, construction debris associated with this work.

3.05 HOUSEKEEPING

A. Manufacturer shall deliver all related operating instructions, maintenance manuals, and warranty registration cards to the general contractor during the completion of the project.

B. Installer shall protect installed products until completion of the installation from all construction debris and natural elements.

C. Manufacturer is responsible for all touch-up repair or replace damaged products during the installation.

D. Installer shall keep area tidy and safe at all times.

E. Clean and dress all sealant prior to installation completion.

F. Clean all glass prior to installation completion.

G. Installer shall clean the entire enclosure one time at the completion of the installation. Cleaning shall include surface cleaning of aluminum framing and glass and cleanup of construction debris. All subsequent cleaning shall be the responsibility of the general contractor.

3.06 PROTECTION

A. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

B. Protect installed products until completion of project.

END OF SECTION

COLONIAL SCHOOL DISTRICT
FACILITES AND SPECIAL PROJECTS
CONTRACT #4-23-01

VOLUME 3 OF 3

SPECIFICATIONS
FOR

JOHN G. LEACH SCHOOL

AT

2460 BEAR CORBITT ROAD
NEW CASTLE, DE 19720

PREPARED
BY

STUDIOJAED ARCHITECTS & ENGINEERS
2500 WRANGLE HILL ROAD
BEAR, DE 19701
STUDIOJAED PROJECT #22144

ISSUED FOR BID
OCTOBER 15, 2025

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COLONIAL SCHOOL DISTRICT
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OCTOBER 15, 2025

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SECTION 00 01 07

SEALS PAGE

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END OF SECTION

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SECTION 00 01 10

TABLE OF CONTENTS

VOLUME 3 OF 3

A. Specifications for this project are arranged in accordance with the Construction Specification Institute numbering system and format. Section numbering is discontinuous and all numbers not appearing in the Table of Contents are not used for this Project.

B. DOCUMENTS BOUND HEREWITH

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

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SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.01 NOTE: THIS SPECIFICATION SECTION AND ACCOMPANYING DIVISION 21 DOCUMENTS AND ASSOCIATED FIRE PROTECTION DRAWINGS REPRESENT THE BASIS FOR THE DESIGN AND INSTALLATION OF A FULLY COMPLIANT AND OPERATIONAL FIRE PROTECTION SYSTEM FOR THIS PROJECT BY THE FIRE PROTECTION CONTRACTOR. ALL DESIGN SERVICES, PERMITTING, TESTING MATERIALS, INTERCONNECTING COMPONENTS, LABOR, AND MAINTENANCE/WARRANTY SHALL BE PROVIDED AS PART OF THE CONTRACT.

1.02 SECTION INCLUDES

A. Above ground piping.

B. Buried piping.

C. Escutcheons.

D. Pipe, fittings, valves, and connections for sprinkler, standpipe and fire hose, and combination sprinkler and standpipe systems.

E. Expansions - hose and braid.

F. Mechanical couplings.

G. Mechanical pressed fittings.

H. Pipe hangers and supports.

I. Piping specialties.

J. Pressure gauges.

K. Pressure relief valves.

1.03 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 09 90 00 - Painting and Coating: Preparation and painting of fire protection piping systems.

C. Section 21 05 33 - Heat Tracing for Fire Suppression Piping

D. Section 21 05 53 - Identification for Fire Supp. Piping and Equipment: Piping identification.

1.04 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems; 2015.

B. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.

C. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.

D. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fuzing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.

E. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.

F. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.

G. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2016.

H. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2017.

I. ASME B16.9 - Factory-Made Wrought Buttwelding Fittings; 2018.

J. ASME B16.11 - Forged Fittings, Socket-welding and Threaded; 2016 (Errata 2017).

K. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2018.

L. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.
M. ASME B16.25 - Buttwelding Ends; 2017.
N. ASME B36.10M - Welded and Seamless Wrought Steel Pipe; 2018.
O. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).
P. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
Q. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2009 (Reapproved 2014).
R. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2019.
S. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).
T. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2013 (Reapproved 2020).
U. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
V. ASTM B75/B75M - Standard Specification for Seamless Copper Tube; 2020.
W. ASTM B75M - Standard Specification for Seamless Copper Tube (Metric); 1999 (Reapproved 2005).
X. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2020.
Y. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
Z. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2016.
AA. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
AB. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40; 2017.
AC. ASTM F439 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2019.
AD. ASTM F442/F442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR); 2020.
AE. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2020.
AF. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011 (Amended 2012).
AG. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.
AH. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.
AI. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2012.
AJ. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2017.
AK. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017, with Errata (2018).
AL. AWWA C606 - Grooved and Shouldered Joints; 2015.
AM. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.
AN. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; 2019.
AO. NFPA 1963 - Standard for Fire Hose Connections; 2019.

AP. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances; National Fire Protection Association; 1995.

AQ. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

AR. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

AS. UL 405 - Fire Department Connection Devices; Current Edition; Including All Revisions.

AT. UL 262 - Gate Valves for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

AU. UL 312 - Check Valves for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.

B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections. Include hydraulic calculations.

C. Project Record Documents: Record actual locations of components and tag numbering.

D. Operation and Maintenance Data: Include installation instructions and spare parts lists.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years experience.

C. Conform to UL requirements.

D. Valves: Bear UL label or marking. Provide manufacturer's name and pressure rating marked on valve body.

E. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

F. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

1.08 PERFORMANCE REQUIREMENTS:

A. Wet-pipe, hydraulically calculated automatic fire sprinkler systems shall be installed in all areas where the temperature is maintained at 40°F or higher at all times. Where indicated on the design drawings and where the temperature is not maintained at 40°F, dry sidewall sprinklers are to be installed.

B. A combination of sidewall, pendent and upright sprinklers shall be installed as noted on the plans. All sprinklers installed shall be quick-response type unless otherwise noted or required by NFPA 13.

C. Pipe sizes for piping downstream and including floor control assemblies shall be determined by hydraulic calculations in accordance with NFPA 13. Verify that field modifications to the system, which require the addition of fittings and pipe, do not affect the hydraulic demand of the automatic fire sprinkler system.

1. If, given the available water supply as indicated above, the automatic fire sprinkler system cannot be designed in compliance with this specification and the applicable codes and standards, provide a report to the Owner documenting the design options that have been investigated. Additionally, copies of the hydraulic calculations, which demonstrate the inability of the water distribution system to supply the necessary water for the sprinkler system demand, shall be submitted for each option.

D. Sprinkler system shall be designed according to the following:
   1. A minimum 5 psi safety margin shall be provided between the residual water supply pressure and the required sprinkler system demand pressure at the calculated system design flow, including all hose allowances.
   2. Sprinkler Occupancy Hazard Classifications shall be as follows:
      a. Light Hazard
         1) Common corridors, offices, conference rooms, bathrooms, classrooms, etc.
      b. Ordinary Hazard, Group 1
         1) Misc. storage areas, maker space, janitor closets, mechanical equipment rooms, electrical equipment rooms, kitchens, etc.
      c. Ordinary Hazard, Group 2
         1) Wood shops, machine shops, etc.
   3. Minimum Density for Automatic Sprinkler System Piping Design:
      a. Light-Hazard Occupancy: 0.10 gpm/s.f. over 1,500 s.f. area.
      b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm/s.f. over 1,500- s.f. area.
      c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm/s.f. over 1,500- s.f. area
   4. Maximum Protection Area per Sprinkler:
      a. Light Hazard Areas: 225 s.f. standard spray sprinklers
      b. Ordinary Hazard Group 1/Group 2 Areas: 130 s.f. standard spray sprinklers
      c. Sprinklers shall be spaced per NFPA 13 requirements.
      d. All obstruction rules shall be strictly adhered to. Additional sprinklers shall be added, where required for compliance with NFPA 13.
   5. Calculate pressure loss due to elevation and friction loss through all fittings, pipes, valves and backflow prevention devices in accordance with NFPA 13.
   6. Hose Allowance:
      a. A total inside and outside hose allowance of 100 gpm shall be required for light hazard occupancies.
      b. A total inside and outside hose allowance of 250 gpm shall be required for ordinary hazard occupancies.

E. Components shall be capable of producing piping systems with 175-psig (1200-kPa) minimum working-pressure rating, unless otherwise indicated.

1.09 ORDER OF PRECEDENCE

A. Should conflicts arise out of discrepancies between documents referenced in this specification, the most stringent requirement shall apply; however, should a level of stringency be indeterminable, the discrepancies shall be resolved as follows:
   1. State and local codes shall take precedence over this specification.
   2. The National Fire Protection Association Standards shall take precedence over this specification.
   3. This specification shall take precedence over the drawings.

1.10 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

1.11 EXTRA MATERIALS

A. Provide two valve stem packings for each size and type of valve installed.

PART 2 PRODUCTS

2.01 FIRE PROTECTION SYSTEMS

A. Sprinkler Systems: Conform work to NFPA 13.

B. Standpipe and Hose Systems: Conform to NFPA 14.

C. Welding Materials and Procedures: Conform to ASME Code.

2.02 BURIED PIPING

A. Steel Pipe: ASTM A53/A53M Schedule 40, black, with AWWA C105 polyethylene jacket, or double layer, half-lapped polyethylene tape.
   1. Steel Fittings: ASME B16.9, wrought steel, buttwelded; with double layer, half-lapped polyethylene tape.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings.
   3. Joints: Welded in accordance with AWS D1.1.
   4. Casing: Closed glass cell insulation.

B. Copper Tube: ASTM B75 (ASTM B75M), O60 or O50 temper.
   1. Type: Type K (A).
   2. Fittings: ASME B16.18, cast copper alloy, solder joint, pressure type.
   3. Joints: AWS A5.8 Classification BCuP-3 or BCuP-4 copper/silver braze.
   4. Casing: Closed glass cell insulation.

C. Cast Iron Pipe: AWWA C151/A21.51.
   1. Fittings: AWWA C110, standard thickness.
   2. Joints: AWWA C111, rubber gasket.
   3. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.

2.03 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A795 Schedule 10 or ASTM A53 Schedule 40, black.
   1. Application:
      a. Pipe sizes 1" through 2" shall be Schedule 40
      b. Pipe sizes 2-1/2" or larger shall be schedule 10
   2. Steel Fittings: ASME B16.9, wrought steel, buttwelded.
   3. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings.
   4. Malleable Iron Fittings: ASME B16.3, threaded fittings.
   5. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
   6. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

B. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), H58 drawn.
   1. Fittings: ASME B16.18, cast copper alloy.
   2. Joints: AWS A5.8M/A5.8 Classification BCuP-3 or BCuP-4 copper/silver braze.
   3. Mechanical Press Sealed Fittings: Double pressed type complying with ASME B16.22, utilizing EPDM, nontoxic synthetic rubber sealing elements.
      a. Manufacturers:
         1) Viega LLC: www.viega.com/#sle.
         2) Substitutions: See Section 01 60 00 - Product Requirements.

C. Cast Iron Pipe: AWWA C151/A21.51.
   1. Fittings: AWWA C110/A21.10, standard thickness.
   2. Joints: AWWA C111, rubber gasket.

3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.04 ESCUTCHEONS

A. Material:
   1. Fabricate from nonferrous metal.
   2. Chrome-plated.
   3. Metals and Finish: Comply with ASME A112.18.1.

B. Construction:
   1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
   2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.05 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

E. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

F. Vertical Support: Steel riser clamp.

G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

H. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.06 EXPANSION JOINTS AND LOOPS - HOSE AND BRAID

A. Manufacturers:
   1. The Metraflex Company; FireLoop: www.metrafire.com/#sle or equal.

B. Provide flexible loops with two flexible sections of hose and braid, two 90-degree elbows, and 180-degree return with support bracket and air release or drain plug.

C. Provide flexible loops capable of movement in the x, y, and z planes. Flexible loops to impart no thrust loads to the building structure.

D. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.
   1. Maximum Allowable Working Pressure: 150 psig at 120 degrees F.
   2. Accommodate the Following:
      a. Axial Deflection in Compression and Expansion: 3/4 inch.
      b. Lateral Movement: 1 inch.
      c. Angular Rotation: 15 degrees.
      d. Force developed by 1.5 times specified maximum allowable operating pressure.
   3. Provide necessary accessories including, but not limited to, swivel joints.

2.07 MECHANICAL COUPLINGS

A. Rigid Mechanical Couplings for Grooved Joints:
   1. Dimensions and Testing: Comply with AWWA C606.
   2. Minimum Working Pressure: 300 psig.
   3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
   4. Housing Coating: Factory applied orange enamel.
   5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
   6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.

2.08 MECHANICAL PRESSED FITTINGS

A. Provide double-pressed type, utilizing EPDM, nontoxic, synthetic rubber sealing elements for use with Schedule 40 carbon steel piping.

2.09 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
   1. Activate electric alarm.
   2. Test and drain valve.
   3. Replaceable internal components without removing valve from installed position.

B. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, accelerator, and with the following additional capabilities and features:
   1. Activate electric alarm.
   2. Test and drain valve.
   3. Externally resettable.
   4. Replaceable internal components without removing valve from installed position.

C. Flooding Deluge Valve: Gate-type valve with rubber-faced disc actuated manually with water motor alarm and electric alarm, with alarm-testing trim.

D. Auxiliary Drains: Condensate collection drain for each section of trapped pipe in preaction or dry fire protection system.

E. Air Venting Valves:

F. Backflow Preventer: Reduced-pressure principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.

G. Commercial Riser Manifold: Preassembled and tested riser manifold in accordance with NFPA 13.

H. Test Connections:
   1. Inspector's Test Connection for Preaction and Dry Pipe Systems:
      a. Provide test connections approximately 6 feet above floor for each or portion of each sprinkler system equipped with an alarm device, located at most remote part of each system.
      b. Route test connection to an open-site drain location, excluding janitor sinks, accepting full flow without negative consequences.
      c. Supply discharge orifice with same size as corresponding sprinkler orifice.
      d. Limit vertical height of exterior wall penetration to 2 feet above finished grade.
   2. Combination Inspector's Test Connection and Drain Valve:
      a. Provide test connections approximately 6 feet above floor for each or portion of each sprinkler system equipped with an alarm device, located at most remote part of each system.
      b. Route combination test connection and drain valve to an open-site drain location, excluding janitor sinks, accepting full flow without negative consequences.
      c. Supply discharge orifice with same size as corresponding sprinkler orifice.
      d. Limit vertical height of exterior wall penetration to 2 feet above finished grade.
   3. Backflow Preventer Test Connection:
      a. Provide downstream of the backflow prevention assembly, listed hose valves with 2.5-inch National Standard male hose threads with cap and chain.
      b. Provide one valve for each 250 gpm of system demand or fraction thereof.
      c. Provide permanent sign reading "Test Valve." See Section 21 05 53.

I. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome-plated gong and motor housing, nylon bearings, and inlet strainer.

J. Electric Alarm: Electrically operated chrome-plated gong with pressure alarm switch.

K. Water Flow Switch: Vane-type switch for mounting horizontally or vertically, with two contacts; rated 10 A at 125 VAC and 2.5 A at 24 VDC.

L. Fire Department Connections:
1. Type: Free standing made of corrosion-resistant metal complying with UL 405.
a. Inlets: Two-way, 2-1/2 inch swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or authority having jurisdiction. Brass caps with gaskets, chains, and lugs.
b. Finish: Chrome.
c. Sleeve: Brass, 18-inch height.
d. Signage: Raised or engraved lettering 1 inch, minimum, indicating system type.

M. Supervisory Switches:
1. Manufacturers:
a. Potter Electric Signal Company, LLC; CoilKeeper Solenoid Supervisory Switch: www.pottersignal.com/#sle.

2.10 PRESSURE GAUGES

A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
1. Case: Steel with brass bourdon tube.
2. Diameter: 4-1/2 inch.
3. Mid-Scale Accuracy: One percent.
4. Scale: Display in psi and kPa.

2.11 PRESSURE RELIEF VALVES

A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

2.12 GATE VALVES

A. Up to and including 2 inches:
1. Bronze body, bronze trim, rising stem, handwheel, solid wedge or disc, threaded ends.

B. Over 2 inches:
1. Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid rubber covered bronze or cast iron wedge, flanged ends.

C. Over 4 inches:
1. Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged ends, iron body indicator post assembly.

2.13 GLOBE VALVES

A. Up to and including 2 inches:
1. Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable rubber disc, threaded ends, with backseating capacity repackable under pressure.

B. Over 2 inches:
1. Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

2.14 BALL VALVES

A. Up to and including 2 inches:
1. Bronze two piece body, brass, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, lever handle and balancing stops, threaded ends .

B. Over 2 inches:
1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle or gear drive handwheel for sizes 10 inches and over, flanged.

2.15 BUTTERFLY VALVES

A. Bronze Body:
   1. Stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and built-in tamper proof switch rated 10 amp at 115 volt AC.

B. Cast or Ductile Iron Body
   1. Cast or ductile iron, chrome or nickel plated ductile iron or aluminum bronze disc, resilient replaceable EPDM seat, wafer, lug, or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and internal tamper switch rated 10 amp at 115 volt AC.

2.16 CHECK VALVES

A. Up to and including 2 inches:
   1. Bronze body and swing disc, rubber seat, threaded ends.

B. Over 2 inches:
   1. Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged ends with automatic ball check.

C. 4 inches and Over:
   1. Iron body, bronze disc, stainless steel spring, resilient seal, threaded, wafer, or flanged ends.

2.17 DRAIN VALVES

A. Compression Stop:
   1. Bronze with hose thread nipple and cap.

B. Ball Valve:
   1. Brass with cap and chain, 3/4 inch hose thread.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Provide thrust blocks for underground piping at elbows and risers.

B. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

C. Install standpipe piping, hangers, and supports in accordance with NFPA 14.

D. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

E. Install piping to conserve building space, to not interfere with use of space and other work.

F. Group piping whenever practical at common elevations.

G. Sleeve pipes passing through partitions, walls, and floors.

H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

I. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

J. Pipe Hangers and Supports:
1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
2. Place hangers within 12 inches of each horizontal elbow.
3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
4. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
6. Provide copper plated hangers and supports for copper piping.
7. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

K. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

L. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to Section 09 90 00.

M. Do not penetrate building structural members unless indicated.

N. Provide sleeves when penetrating footings, floors, and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.
1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
2. Aboveground Piping:
a. Pack solid using mineral fiber complying with ASTM C592.
b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
3. All Rated Openings: Caulk tight with firestopping material complying with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.
4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

O. Manufactured Sleeve-Seal Systems:
1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
3. Locate piping in center of sleeve or penetration.
4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
5. Tighten bolting for a watertight seal.
6. Install in accordance with manufacturer's recommendations.

P. Escutcheons:
1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

Q. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

R. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

S. Install valves with stems upright or horizontal, not inverted. Remove protective coatings after installation.

T. Provide gate, ball, or butterfly valves for shut-off or isolating service.

U. Provide drain valves at main shut-off valves, low points of piping and apparatus.

3.03 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

C. Flush system with water and drain as required to remove dirt and sludge.

D. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

END OF SECTION

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SECTION 21 05 33
HEAT TRACING FOR FIRE SUPPRESSION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Self-Regulating Heating Cable

B. Connection kits for joining heating cable sections.

C. Electronic Heat Trace Controller

D. Heating Cable Installation Accessories.

1.02 RELATED REQUIREMENTS

A. Section 21 05 53 - Identification for Fire Supp. Piping and Equipment.

B. Section 21 07 19 - Fire Suppression Piping Insulation.

C. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.

D. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

1.03 REFERENCE STANDARDS

A. IEEE 515.1 - IEEE Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Commercial Applications; 2022.

B. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

E. UL 515A - Outline of Investigation for Electrical Resistance Tracing Heating and Associated Controls for Use in Sprinkler and Standpipe Systems.

F. CSA C22.2 NO. 130-03-2008 Requirements for Electrical Resistance Heating Cables and Heating Device Sets.

G. UL 508 - Standard for Industrial Control Equipment.

H. UL 864 - Standard for Control Units and Accessories for Fire Alarm Systems.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

B. Coordinate the work with other trades to provide ground fault protection for electric heat tracing circuits as required by NFPA 70.

C. Coordinate the work with other trades to provide circuit breaker ratings suitable for installed circuit lengths.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for electric heat tracing and accessories.

C. Shop Drawings: Indicate electric heat tracing layout, electrical terminations, thermostats, controls, and branch circuit connections.

D. Manufacturer's Installation Instructions: Indicate installation instructions and recommendations.

E. Project Record Documents: Record actual locations of electric heat tracing lines and thermostats.

F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions of equipment and controls, maintenance and repair data, and parts listings.

G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide two year manufacturer warranty for cables, connection kits, accessories, and controls.

PART 2 PRODUCTS

2.01 SELF-REGULATING PARALLEL RESISTANCE ELECTRIC HEATING CABLE

A. Manufacturers:
   1. Chromalox, Inc: www.chromalox.com/#sle.
   2. Pentair: www.pentairthermal.com/#sle.
   3. Thermon Manufacturing Company: www.thermon.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Provide products listed, classified, and labeled by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction (AHJ) specifically for use on main and branch sprinkler lines in accordance with NFPA 13.

C. Factory Rating and Testing: Comply with IEEE 515.1.

D. Heating Element:
   1. Provide pair of parallel #16 AWG tinned or nickel coated stranded copper bus wires embedded in cross linked conductive polymer core with varying heat output in response to temperature along its length.
   2. Terminations: Waterproof, factory assembled, non-heating leads with connector at one end and water-tight seal at opposite end.
   3. Capable of crossing over itself without overheating.

E. Insulated Jacket: Flame retardant polyolefin.

F. The self-regulating, heating cable shall have a tinned-copper ground braid.

G. The heating cable system vendor shall provide design heat loss information on all piping and select a self-regulating, heating cable capacity (watts per linear foot) to prevent freezing of the pipe.

H. Cable Cover: Provide tinned copper and polyolefin outer jacket with UV inhibitor.

I. Maximum Power-On Operating Temperature: 150 degrees F.

J. Maximum Power-Off Exposure Temperature: 185 degrees F.

K. Electrical Characteristics: See electrical drawings.

L. Connection Kits:
   1. Heating Cable Connection Kits shall be Chromalox DL series or approved equal.
   2. Manufacturer to provide connection kits for power, splice, tee and end seal.
   3. All splices, tees, and end seals shall be installed above the insulation per NEC.
   4. Power connection kits shall be NEMA 4X rated to prevent water ingress and corrosion.
   5. Connection kits shall be UV stabilized for installation indoors.
   6. Connection kits shall be UL listed.

M. Heating Cable Accessories:
   1. Heating cables shall be attached to metal fire sprinkler piping with Chromalox FT-66 glass fiber, glass tape or approved equal. Use of metal zip ties is prohibited for the attachment of heating cable to the fire sprinkler piping.

2. Contractor shall provide Chromalox WL-5 Heating Tracing Labels every 10' opposite sides of the pipe to identify fire sprinkler piping with heat tracing cable installed on it.

N. Heat Tracing Controller:
1. Basis of Design is Chromalox IntelliTrace ITC-FS Controller for one or two circuits.
2. Unit shall be UL 864 approved for use on fire sprinkler piping including 6000V surge suppression.
3. Unit shall operate at 100-277 VAC and rated @ 40A per circuit.
4. Unit shall include a 3.5" high resolution display with integral display heater, front panel touchscreen display and LED indication of power, load and alarm.
5. Unit shall include ON/OFF, PID or Manual SSR power control with a selectable Soft Start program.
6. Unit shall include two (2) sensors per circuit with one (1) RTD for ambient temperature control and one (1) RTD for monitoring of the Heat Tracing.
7. Unit shall include two common alarm outputs (1 AC, 1 DC), Alarms for Low/High Temperature or Current, GFEP (Ground Fault Equipment Protection) and Sensor Failure, Modbus, RTU/RS485 (or RS422) Communications and user selectable manual output on failed sensor per UL 515A.
8. Unit shall be housed in a 316 Stainless Steel enclosure with hinged door.
9. Unit shall include BACNet protocol converter for connecting an IntelliTrace ITC controller to BACNet network. Protocol converter shall be housed in a NEMA4 enclosure with separate power supply.

O. Temperature Sensors - Two (2) required
1. Provide one Chromalox LN-50 or approved equal, 100 ohm, three wire, line sensing, temperature sensor with 3"L x 3/16"D probe. Unit shall include 50' pigtail wire in a stainless steel sheath to protect wiring and 1/2" conduit fitting.
2. Provide one Chromalox LA-50, 100 ohm, three wire, ambient sensing, temperature sensor with copper sheathed probe with vented guard. Unit shall include 1/2" NPT fitting for mounting into condulet fitting by others.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping and equipment are ready to receive work.

B. Verify field measurements are as indicated on shop drawings.

C. Verify required power is available, in proper location, and ready for use.

3.02 PREPARATION

A. Clean all surfaces prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer.

3.03 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Comply with installation requirements of IEEE 515.1, NFPA 70, Article 427, and applicable requirements of NFPA 13.

C. Apply heating cable linearly on pipe with fiberglass tape only after piping has successfully completed any required pressure testing.

D. Comply with applicable local code requirements.

E. Identification:
1. After thermal insulation installation, apply external pipeline decals to indicate presence of the thermal insulation cladding at intervals not to exceed 20 ft including cladding over each valve or other equipment that may require maintenance.

F. Electronic Supervision:
1. Provide positive confirmation that circuit is energized in accordance with the requirements of NFPA 13.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Perform start-up by factory technician or factory representative in accordance with Owner's requirements.

C. Field Testing and Inspections:
   1. Commission system in accordance with installation and operation manual.
   2. Inspect for sources of water entry and proper sealing.
   3. Inspect weather barrier to confirm that no sharp edges are contacting the trace heating.
   4. Verify that thermal insulation around the sprinkler heads is in accordance with manufacturer's instructions and does not impede the water pattern emitted by the sprinkler head.
   5. Insulation Resistance: 20 megohms or greater at a test voltage of 2500 VDC for polymer insulated trace heaters.
   6. Test heating cable integrity with megohmmeter at the following intervals:
   7. Measure voltage and current at each unit.
   8. Controls:

3.05 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 21 05 53
IDENTIFICATION FOR FIRE SUPP. PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe Markers.

D. Ceiling tacks.

1.02 RELATED REQUIREMENTS

A. Section 09 90 00 - Painting and Coating: Identification painting.

1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.

1.04 SUBMITTALS

A. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

C. Product Data: Provide manufacturers catalog literature for each product required.

D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

E. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Automatic Controls: Nameplates.

B. Control Panels: Nameplates.

C. Piping: Pipe markers.

D. Relays: Tags.

E. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.02 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Champion America, Inc: www.Champion-America.com.

C. Seton Identification Products: www.seton.com/aec.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch.
   3. Background Color: Black.

2.04 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

B. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.05 PIPE MARKERS

A. Color: Conform to ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.06 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded coordinated with owner.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Apply stencil painting in accordance with Section 09 90 00.

D. Install plastic pipe markers in accordance with manufacturer's instructions.

E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

G. Identify pumps and valves with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

H. Identify control panels and major control components outside panels with plastic nameplates.

I. Identify thermostats relating to terminal boxes or valves with nameplates.

J. Identify valves in main and branch piping with tags.

K. Tag automatic controls, instruments, and relays. Key to control schematic.

L. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

M. Locate ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 21 07 19
FIRE SUPPRESSION PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019.

B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).

C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2019.

D. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2017, with Editorial Revision (2018).

E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2018).

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER

A. Manufacturers:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Johns Manville Corporation: www.jm.com/#sle.
   3. Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: www.knaufinsulation.com/#sle.
   4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
   1. K Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 650 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

D. Vapor Barrier Lap Adhesive: Compatible with insulation.

E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

2.03 CELLULAR GLASS

A. Manufacturers:
   1. Owens Corning Corporation: www.ocbuildingspec.com/#sle.

B. Pipe and Tube Insulation: ASTM C552, Type II, Grade 6.
   1. K Value: 0.35 at 100 degrees F.
   2. Service Temperature Range: From minus 450 degrees F to 800 degrees F.
   3. Water Vapor Permeability: 0.005 perm inch maximum per inch.
   4. Water Absorption: 0.5 percent by volume, maximum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert Location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

E. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.

F. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Coordinate with heat trace manufacturer's installation instructions.

END OF SECTION

SECTION 21 13 00
FIRE SUPPRESSION SPRINKLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. Dry-pipe sprinkler system.

C. System design, installation, and certification.

D. Fire department connections.

1.02 RELATED REQUIREMENTS

A. Section 28 31 00 - Fire Detection and Alarm.

B. Section 21 05 00 - Common Work Results for Fire Suppression: Pipe, fittings, and valves.

C. Section 21 05 48 - Vibration and Seismic Controls for Fire Suppression Piping and Equipment.

D. Section 21 05 53 - Identification for Fire Supp. Piping and Equipment.

E. Section 21 30 00 - Fire Pumps.

F. Section 21 12 00 - Fire-Suppression Standpipes.

G. Section 14 91 00 - Facility Chutes: Sprinkler heads inside chutes.

H. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

I. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

J. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; current edition.

B. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

C. ITS (DIR) - Directory of Listed Products; current edition.

D. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.

E. NFPA 13R - Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies; 2019.

F. NFPA 1963 - Standard for Fire Hose Connections; 2019.

G. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.04 SUBMITTALS

A. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

B. Shop Drawings:
   1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
   2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
   3. Submit shop drawings and hydraulic calculations to authority having jurisdiction and Fire Marshall for approval. Submit proof of approval to Architect.

C. Samples: Submit one of each style of sprinkler specified.

D. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

E. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

F. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
   2. Sprinkler Wrenches: For each sprinkler type.

1.05 QUALITY ASSURANCE

A. Maintain one copy of referenced design and installation standard on site.

B. Conform to UL requirements.

C. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

E. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience approved by manufacturer.

F. Equipment and Components: Provide products that bear UL label or marking.

G. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories Inc. or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.06 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.08 EXTRA MATERIALS

A. Provide extra sprinklers of type and size matching those installed, in quantity required by referenced NFPA design and installation standard.

B. Provide suitable wrenches for each sprinkler type.

C. Provide metal storage cabinet located adjacent to alarm valve.

PART 2 PRODUCTS

2.01 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for building areas noted.

B. Occupancy: comply with NFPA 13.

C. Water Supply: Determine volume and pressure from water flow test data.
   1. Revise design when test data available prior to submittals.

D. Interface system with building fire and smoke alarm system.

E. Provide fire department connections where indicated.

F. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.02 SPRINKLERS

A. Suspended Ceiling Type: Recessed-type, chrome-plated with push on, clamp, or screw type escutcheon plates.
   1. Finish: Enamel, color below.
      a. Within Standard Acoustical Tile Ceilings: White with White Estucheon Plate
      b. Within Accent Ceiling Clouds and Soffits: Color as selected by Architect

2. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

B. Exposed Area Type: Standard upright type with guard.
1. Finish: Chrome plated.
2. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

C. Sidewall Type: Semi-recessed sidewall type with matching push on escutcheon plate and guard.
1. Finish: Enamel, color as selected.
2. Escutcheon Plate Finish: Enamel, color as selected.
3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

D. Dry Sprinklers: Standard, Recessed or Exposed pendant type with matching push on escutcheon plate.
1. Finish: Chrome plated.
2. Escutcheon Plate Finish: Chrome plated.
3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

E. Guards: Finish to match sprinkler finish.

F. Spray Nozzles: Brass with solid cone discharge, 30 degrees of arc with blow-off dust cap.

2.03 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
1. Activate electric alarm.
2. Test and drain valve.
3. Replaceable internal components without removing valve from installed position.

B. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm, accelerator, and with the following additional capabilities and features:
1. Activate electric alarm.
2. Test and drain valve.
3. Externally resettable.
4. Replaceable internal components without removing valve from installed position.
5. Manufacturers:
a. Victaulic Company; Series 768 - NXT: www.victaulic.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Backflow Preventer: Reduced pressure principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.

D. Test Connections:
1. Backflow Preventer Test Connection:
a. Provide downstream of the backflow prevention assembly, listed hose valves with 2.5 inch National Standard male hose threads with cap and chain.
b. Furnish one valve for each 250 gpm of system demand or fraction thereof.
c. Provide permanent sign reading "Test Valve" in accordance with Section 21 05 53.

E. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome plated gong and motor housing, nylon bearings, and inlet strainer.

2.04 NITROGEN GENERATOR

A. Electric Alarm: Electrically operated chrome plated gong with pressure alarm switch.
1. Nitrogen Generator:
a. Provide FM (AG) approved system and accessories.

B. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.
1. Accessories:

a. Provide control panel or remote annunciator panel.
b. Provide air maintenance device.
c. Provide nitrogen storage tank sized to comply with NFPA 13.
d. Provide purge valves to remove oxygen from the system.
e. Provide nitrogen analyzer to determine the nitrogen purity.
f. Provide system with replaceable filters.

C. Fire Department Connections:
1. Type: Free standing made of corrosion resistant metal complying with UL 405.
a. Inlets: Two way, 2-1/2 inch swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.
b. Outlet: Bottom with pipe threads, 4 NPS.
c. Rated Working Pressure: 175 psi.
d. Finish: Chrome.
e. Sleeve: Brass, 18 inches height.
f. Signage: Raised or engraved lettering 1 inch minimum indicating system type.
g. Manufacturers:
1) Elkhart Brass Manufacturing Company, Inc: www.elkhartbrass.com/#sle.
2) Fire End & Croker Corporation: www.croker.com/#sle.
3) Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Remove sprinkler heads as required for flushing of system.

B. All new sprinkler heads are to be provided with minimum 24" braided flexible hose and are to be centered in ceiling tiles.

C. Install in accordance with referenced NFPA design and installation standard.

D. Install equipment in accordance with manufacturer's instructions.

E. Place pipe runs to minimize obstruction to other work.

F. Place piping in concealed spaces above finished ceilings.

G. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.

H. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

I. Install and connect to fire pump system in accordance with Section 21 30 00.

J. Flush entire piping system of foreign matter.

K. Install guards on sprinklers where indicated.

L. Hydrostatically test entire system.

M. Require test be witnessed by Fire Marshal and authority having jurisdiction.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

SECTION 22 05 16

EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flexible pipe connectors.

B. Expansion joints and compensators.

C. Pipe loops, offsets, and swing joints.

1.02 RELATED REQUIREMENTS

A. Section 21 05 00 - Common Work Results for Fire Suppression.

B. Section 22 10 05 - Plumbing Piping.

1.03 REFERENCE STANDARDS

A. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a (Reapproved 2019).

B. EJMA (STDS) - EJMA Standards; Tenth Edition.

1.04 SUBMITTALS

A. Product Data:

1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

B. Design Data: Indicate selection calculations.

C. Manufacturer's Instructions: Indicate manufacturer's installation instructions, special procedures, and external controls.

D. Project Record Documents: Record installed locations of flexible pipe connectors, expansion joints, anchors, and guides.

E. Maintenance Data: Include adjustment instructions.

1.05 REGULATORY REQUIREMENTS

A. Conform to UL or Warnock Hersey requirements.

1.06 EXTRA MATERIALS

A. Supply two sets of packing for each packed expansion joint.

PART 2 PRODUCTS

2.01 FLEXIBLE PIPE CONNECTORS - STEEL PIPING

A. Manufacturers:

1. Mercer Rubber Company: www.mercer-rubber.com/#sle.
2. Metraflex Company: www.metraflex.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Inner Hose: Carbon Steel, Stainless Steel or Bronze.

C. Exterior Sleeve: Single braided or Double braided, stainless steel or bronze.

D. Exterior Sleeve: None.

E. Pressure Rating: 125 psi and 450 degrees F or 200 psi and 250 degrees F.

F. Joint: As specified for pipe joints.

G. Size: Use pipe sized units.

H. Maximum offset: 3/4 inch on each side of installed center line.

2.02 FLEXIBLE PIPE CONNECTORS - COPPER PIPING

A. Manufacturer:
   1. Mercer Rubber Company: www.mercer-rubber.com/#sle.
   2. Metraflex Company: www.metraflex.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Inner Hose: Bronze.

C. Exterior Sleeve: Braided bronze.

D. Pressure Rating: 125 psi and 450 degrees F or 200 psi and 250 degrees F.

E. Joint: As specified for pipe joints.

F. Size: Use pipe sized units.

G. Maximum offset: 3/4 inch on each side of installed center line.

H. Application: Copper piping.

2.03 EXPANSION JOINTS - STEEL WITH PACKED SLIDING SLEEVE

A. Working Pressure and Temperature: Class 150 or Class 300.

B. Joint: As specified for pipe joints.

C. Size: Use pipe sized units.

D. Application: Steel piping 2 inches and over.

2.04 EXPANSION JOINTS - COPPER WITH PACKED SLIDING SLEEVE

A. Working Pressure: 125 psi.

B. Maximum Temperature: 250 degrees F.

C. Joint: As specified for pipe joints.

D. Size: Use pipe sized units.

E. Application: Copper or steel piping 2 inches and over.

2.05 ACCESSORIES

A. Stainless Steel Pipe: ASTM A269.

B. Pipe Alignment Guides:
   1. Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inches travel.

C. Swivel Joints:
   1. Fabricated steel, Bronze, Ductile Iron or Cast steel body, double ball bearing race, field lubricated, with rubber (Buna-N) o-ring seals.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.

C. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.

D. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.

E. Anchor pipe to building structure where indicated. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.

F. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

G. Substitute grooved piping for vibration isolated equipment instead of flexible connectors. Grooved piping need not be anchored.

END OF SECTION

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SECTION 22 05 19
METERS AND GAGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Positive displacement meters.

B. Pressure gages and pressure gage taps.

C. Thermometers and thermometer wells.

D. Static pressure gages.

E. Filter gages.

1.02 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.

B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle, and Venturi; 2004 (Reaffirmed 2017).

C. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014 (Reapproved 2020).

D. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014 (Reapproved 2021).

E. AWWA C700 - Cold-Water Meters -- Displacement Type, Metal Alloy Main Case; 2015.

F. AWWA C701 - Cold-Water Meters -- Turbine Type, for Customer Service; 2019.

G. AWWA C702 - Cold-Water Meters -- Compound Type; 2019.

H. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold Water Meters; American Water Works Association; 2010 (ANSI/AWWA C706).

I. AWWA M6 - Water Meters -- Selection, Installation, Testing, and Maintenance; 2012, with Addendum (2018).

J. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

B. Project Record Documents: Record actual locations of components and instrumentation.

C. Operation and Maintenance Data: .

1.04 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

1.05 EXTRA MATERIALS

A. Supply two bottles of red gage oil for static pressure gages.

B. Supply two pressure gages with pulsation damper or dial thermometers.

PART 2 PRODUCTS

2.01 LIQUID FLOW METERS

A. Manufacturers:
   1. Dwyer Instruments, Inc: www.dwyer-inst.com.
   2. Venture Measurement, a Danaher Corporation Company: www.venturemeasurement.com.
   3. Omega Meters: www.omega.com.

B. Description: Totalizing turbine-type flow meter with rate indication and pulse output.

1. Maximum Working Pressure:
   a. PVC: 150 psi
   b. Carbon Steel: 200 psi
2. Maximum Temperature:
   a. PVC: 49°C (120°F)
   b. Carbon Steel: 93°C (200°F)
3. Accuracy: ±1% FS
4. Signal: Squarewave pulse
5. Power :6 to 24 Vdc
6. Materials
   a. Meter Body: PVC or carbon steel
   b. Flanges: Van Stone w/steel backing flange for PVC bodies, 150# ANSI for carbon steel bodies
   c. Turbine Rotor: PVDF
   d. Rotor Shafts: Zirconia ceramic
   e. Bearings: Sapphire journal, ruby ball
7. Display
   a. Power: 11 to 24 Vdc, 20 mA max
   b. Rate: 8-digit autorange
   c. Total: 8-digit, selectable decimal
   d. Memory: Non-volatile (no battery needed)
   e. Pulse Output: 0.1 sec, open collector Analog Option 4 to 20 mA, user-programmable
8. Transmitter
   a. Output: 4 to 20 mA
   b. Loop Power: 12 to 26 Vdc (isolated)
   c. Accuracy: ±1%
   d. Response Time: 3 sec, 95% FS

2.02 PRESSURE GAGES

A. Manufacturers:
   1. Dwyer Instruments, Inc: www.dwyer-inst.com/#sle.
   2. Moeller Instrument Co., Inc: www.moellerinstrument.com/#sle.
   3. Omega Engineering, Inc: www.omega.com/#sle.

B. Pressure Gages: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
   1. Case: Steel with brass bourdon tube.
   2. Size: 4-1/2 inch diameter.
   3. Size: 2 inch diameter.
   4. Mid-Scale Accuracy: One percent.
   5. Scale: Psi.

2.03 PRESSURE GAGE TAPPINGS

A. Gage Cock: Tee or lever handle, brass for maximum 150 psi.

B. Needle Valve: Brass or Stainless Steel, 1/4 inch NPT for minimum 150 psi.

C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.

D. Syphon: Steel, Schedule 40, 1/4 inch angle or straight pattern.

2.04 STEM TYPE THERMOMETERS

A. Manufacturers:
   1. Dwyer Instruments, Inc: www.dwyer-inst.com/#sle.
   2. Omega Engineering, Inc: www.omega.com/#sle.
   3. Weksler Glass Thermometer Corp: www.wekslerglass.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Thermometers - Fixed Mounting: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish.
   1. Size: 9 inch scale.
   2. Window: Clear Lexan.
   3. Size: 9 inch scale.
   4. Window: Clear glass or Lexan.
   5. Accuracy: 2 percent, per ASTM E77.
   6. Calibration: Degrees F.

C. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
   1. Size: 9 inch scale.
   2. Window: Clear Lexan.
   3. Size: 9 inch scale.
   4. Window: Clear glass or Lexan.
   5. Stem: 3/4 inch NPT brass.
   6. Accuracy: 2 percent, per ASTM E77.
   7. Calibration: Degrees F.

2.05 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.06 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass or stainless steel fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Nordel core for temperatures up to 350 degrees F.

B. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch diameter pressure gages, one gage adapters with 1/8 inch probes, two 1 inch dial thermometers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install positive displacement meters with isolating valves on inlet and outlet to AWWA M6. Provide full line size valved bypass with globe valve for liquid service meters.

C. Provide one pressure gage per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gage.

D. Install pressure gages with pulsation dampers. Provide gage cock or needle valve to isolate each gage. Extend nipples and siphons to allow clearance from insulation.

E. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

F. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets. Refer to Section 23 09 43.

G. Coil and conceal excess capillary on remote element instruments.

H. Provide instruments with scale ranges selected according to service with largest appropriate scale.

I. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

J. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

K. Locate test plugs adjacent thermometers and thermometer sockets, adjacent to pressure gages and pressure gage taps, adjacent to control device sockets or where indicated.

3.02 SCHEDULES

A. Positive Displacement Meters, Location:
   1. Domestic cold water.
   2. Expansion tank make-up.

B. Pressure Gages, Location and Scale Range:
   1. Pumps, 0 to 100 psi.
   2. Expansion tanks, 0 to 100 psi.
   3. Sprinkler system, 0 to 100 psi.
   4. Backflow preventers, 0 to 100 psi.

C. Pressure Gage Tappings, Location:
   1. Control valves 3/4 inch & larger - inlets and outlets.
   2. Major coils - inlets and outlets.
   3. Heat exchangers - inlets and outlets.

D. Stem Type Thermometers, Location and Scale Range:
   1. Domestic hot water supply and recirculation, 0 to 220 degrees F.

END OF SECTION

SECTION 22 05 48

VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

SEE SPECIFICATION SECTION 23 05 48

PART 1 GENERAL

2.01 SECTION INCLUDES

A. Vibration isolation requirements.

2.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Materials and requirements for fabricated metal supports.

2.03 DEFINITIONS

2.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

2.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

2.06 QUALITY ASSURANCE

A. Comply with applicable building code.

2.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

3.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing plumbing equipment and/or plumbing connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
   1. Select vibration isolators to provide required static deflection.
   2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.

D. Equipment Isolation: As indicated on drawings.

E. Piping Isolation:
   1. Provide vibration isolators for piping supports:
      a. Located in equipment rooms.
      b. Located within 50 feet of connected vibration-isolated equipment and pressure-regulating valve (PRV) stations.

c. For piping over 2 inch located below or within 50 feet of noise-sensitive areas indicated.

2. Minimum Static Deflection:
3. Suspended Piping, Nonseismic Applications: Use resilient material isolator hangers, spring isolator hangers, or combination resilient material/spring isolator hangers.

PART 3 EXECUTION

4.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

4.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Vibration Isolation Systems:
1. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
2. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
3. Adjust isolators to be free of isolation short circuits during normal operation.
4. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

END OF SECTION

SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe Markers.

1.02 RELATED REQUIREMENTS

A. Section 09 90 00 - Painting and Coating: Identification painting.

B. Section 22 60 00 - Gas and Vacuum Systems for Laboratory and Healthcare Facilities: Supply of pipe labels for placement under this section.

1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

1.04 SUBMITTALS

A. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

C. Product Data: Provide manufacturers catalog literature for each product required.

D. Samples: Submit two labels; tags in size.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Nameplates:
   1. Control panels, transducers, and other related control equipment products.

B. Tags:
   1. Piping: 3/4 inch diameter and smaller.
   2. Manual operated and automated control valves.

C. Stencil:
   1. Heat exchangers, water heaters, and other heat transfer products.
   2. Pumps, tanks, filters, water treatment devices, and other fluid managing products.
   3. Ceiling tacks placed on lay-in ceiling surface to reference plumbing components.

D. Pipe Markers: 3/4 inch diameter and higher.

2.02 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Champion America, Inc: www.Champion-America.com.

C. Seton Identification Products: www.seton.com/aec.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: Black.
   2. Letter Height: 1/2 inch.

3. Background Color: Yellow.

2.04 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter or square.

B. Metal Tags: Brass, aluminum, or stainless steel with stamped letters; tag size minimum 1-1/2 inch diameter or square with smooth edges.

C. Chart: Typewritten letter size list in anodized aluminum frame.

2.05 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
6. Ductwork and Equipment: 2-1/2 inch high letters.

B. Stencil Paint: As specified in Section 09 90 00, semi-gloss enamel, colors conforming to ASME A13.1.

2.06 PIPE MARKERS

A. Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.07 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:
1. HVAC Equipment: Yellow.
2. Fire Dampers and Smoke Dampers: Red.
3. Plumbing Valves: Green.
4. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

3.02 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Apply stencil painting in accordance with Section 09 90 00.

D. Install plastic pipe markers in accordance with manufacturer's instructions.

E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

G. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates or stencil painting. Small devices, such as in-line pumps, may be identified with tags.

H. Identify control panels and major control components outside panels with plastic nameplates.

I. Identify thermostats relating to terminal boxes or valves with nameplates.

J. Identify valves in main and branch piping with tags.

K. Identify air terminal units and radiator valves with numbered tags.

L. Tag automatic controls, instruments, and relays. Key to control schematic.

M. Identify piping, concealed or exposed, with plastic pipe markers or plastic tape pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

N. Identify ductwork with plastic nameplates or stenciled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

O. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

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SECTION 22 07 16
PLUMBING EQUIPMENT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flexible elastomeric cellular insulation.

B. Equipment insulation.

C. Covering.

1.02 RELATED REQUIREMENTS

A. Section 09 90 00 - Painting and Coating: Painting insulation covering.

B. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

C. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

D. Section 23 21 13 - Hydronic Piping: Placement of hangers and hanger inserts.

E. Section 23 21 14 - Hydronic Specialties.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

D. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019.

E. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).

F. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

G. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2016.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

I. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

J. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for equipment scheduled.

C. Samples: Submit two samples of any representative size illustrating each insulation type.

D. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with not less than three years of experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.07 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturers:
   1. Knauf Insulation; : www.knaufusa.com.
   2. Johns Manville Corporation; : www.jm.com.
   3. Owens Corning Corp; : www.owenscorning.com/#sle.
   4. CertainTeed Corporation; : www.certainteed.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: ASTM C553; flexible, noncombustible.
   1. 'K' Value: 0.36 at 75 degrees F, when tested in accordance with ASTM C177 or ASTM C518.
   2. Maximum Service Temperature: 450 degrees F, 850 degrees F, 1000 degrees F or 1200 degrees F.
   3. Maximum Water Vapor Sorption: 5.0 percent by weight.

C. Vapor Barrier Jacket: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film or Vinyl.
   1. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   2. Secure with self-sealing longitudinal laps and butt strips.
   3. Secure with outward clinch expanding staples and vapor barrier mastic.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive:
   1. Compatible with insulation.

F. Insulating Cement/Mastic:
   1. ASTM C195; hydraulic setting on mineral wool.

2.03 GLASS FIBER, RIGID

A. Manufacturer:
   1. Knauf Insulation: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com/#sle.
   4. CertainTeed Corporation; www.certainteed.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: ASTM C612 or ASTM C592; rigid, noncombustible.

1. 'K' Value: 0.25 at 75 degrees F, when tested in accordance with ASTM C177 or ASTM C518.
2. Maximum Service Temperature: 850 degrees F or 1200 degrees F.
3. Maximum Water Vapor Sorption: 5.0 percent by weight.
4. Maximum Density: 8.0 lb/cu ft or 12.0 lb/cu ft.

C. Vapor Barrier Jacket:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film or Vinyl.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
3. Secure with self-sealing longitudinal laps and butt strips.
4. Secure with outward clinch expanding staples and vapor barrier mastic.

D. Facing: 1 inch galvanized steel hexagonal wire mesh stitched on one face of insulation.

E. Vapor Barrier Lap Adhesive:
1. Compatible with insulation.

F. Insulating Cement/Mastic:
1. ASTM C195; hydraulic setting on mineral wool.

2.04 CELLULAR GLASS

A. Manufacturer:
1. Pittsburgh Corning Corporation: www.foamglasinsulation.com/#sle.

B. Insulation: ASTM C552, Grade 2.
1. 'K' Value: 0.41 at 100 degrees F.
2. Service Temperature: Up to 900 degrees F.
3. Water Vapor Permeability: 0.005 perm inch.
4. Water Absorption: 0.2 percent by volume, maximum.
5. Density: Minimum 6.80 lb/cu ft.

2.05 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:
1. Armacell International: www.armacell.com/#sle.
2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C 534 Grade 3, Grad 2 or Grade 1, in sheet form.
1. Minimum Service Temperature: -40 degrees F.
2. Maximum Service Temperature: 220 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.06 JACKETS

A. PVC Plastic:
1. Manufacturers:
a. Johns Manville Corporation: www.jm.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.
2. Jacket: Sheet material, off-white color.
a. Minimum Service Temperature: -40 degrees F.
b. Maximum Service Temperature: 150 degrees F.
c. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
d. Thickness: 10 mil.
e. Connections: Brush on welding adhesive or Pressure sensitive color matching vinyl tape.
3. Covering Adhesive Mastic:
a. Compatible with insulation.

B. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
   1. Lagging Adhesive:
      a. Compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Factory Insulated Equipment: Do not insulate.

C. Exposed Equipment: Locate insulation and cover seams in least visible locations.

D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

E. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

F. Insulated equipment containing fluids below ambient temperature: Insulate entire system.

G. Fiber glass insulated equipment containing fluids below ambient temperature: Provide vapor barrier jackets, factory-applied or field-applied. Finish with glass cloth and vapor barrier adhesive.

H. For hot equipment containing fluids 140 degrees F or less, do not insulate flanges and unions, but bevel and seal ends of insulation.

I. For hot equipment containing fluids over 140 degrees F, insulate flanges and unions with removable sections and jackets.

J. Fiber glass insulated equipment containing fluids above ambient temperature: Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Finish with glass cloth and adhesive.

K. Inserts and Shields:
   1. Application: Equipment 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel or Steel between hangers and inserts.
   3. Insert location: Between support shield and equipment and under the finish jacket.
   4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

L. Finish insulation at supports, protrusions, and interruptions.

M. Cover glass fiber insulation with metal mesh and finish with heavy coat of insulating cement.

N. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

O. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

3.03 SCHEDULES

A. Equipment: Domestic hot-water storage tanks, heat exchangers, and expansion tanks, not factory insulated.
   1. Operating Temperature: 55 to 140 degrees F.
   2. Insulation Material: Glass Fiber
   3. Insulation Thickness: 2 inch.
   4. Field-Applied Jacket: PVC
   5. Vapor Retarder Required: No

6. Finish: None.

END OF SECTION

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SECTION 22 07 19
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flexible elastomeric cellular insulation.

B. Piping insulation.

C. Jackets and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

D. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019.

E. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).

F. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2013).

G. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

H. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2020.

I. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2019.

J. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2017, with Editorial Revision (2018).

K. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2019.

L. ASTM C585 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing; 2010 (Reapproved 2016).

M. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation; 2020.

N. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2018).

O. ASTM D1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber; 2014.

P. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2019.

Q. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

R. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

S. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

T. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

B. Samples: Submit two samples of any representative size illustrating each insulation type.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience, or and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

2.02 GLASS FIBER

A. Manufacturers:
   1. Knauf Insulation: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation; : www.certainteed.com.
   5. Substitutions: See Gilbane Project Manual.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum service temperature: 850 degrees F; 1200 degrees F; 1600 degrees F.
   3. Maximum moisture absorption: 0.2 percent by volume.

C. Insulation: ASTM C547 ; semi-rigid, noncombustible, end grain adhered to jacket.
   1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum service temperature: 650 degrees F.
   3. Maximum moisture absorption: 0.2 percent by volume.

D. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

F. Vapor Barrier Lap Adhesive:
   1. Compatible with insulation.

G. Insulating Cement/Mastic:
   1. ASTM C195; hydraulic setting on mineral wool.

H. Fibrous Glass Fabric:
   1. Cloth: Untreated; 9 oz/sq yd weight.
   2. Blanket: 1.0 lb/cu ft density.

3. Weave: 5x5; 10x10; or 10x20.

I. Indoor Vapor Barrier Finish:
1. Cloth: Untreated; 9 oz/sq yd weight.
2. Vinyl emulsion type acrylic, compatible with insulation, black or white color.

J. Outdoor Vapor Barrier Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

K. Outdoor Breather Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

L. Insulating Cement:
1. ASTM C449/C449M.

2.03 CELLULAR GLASS

A. Manufacturers:
1. Pittsburgh Corning Corporation: www.foamglasinsulation.com/#sle.
2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: ASTM C552, Grade 1.
1. 'K' value: 0.37 at 100 degrees F.
2. Service Temperature: Up to 900 degrees F.
3. Water Vapor Permeability: 0.005 perm inch.
4. Water Absorption: 0.2 percent by volume, maximum.

2.04 EXPANDED POLYSTYRENE

A. Manufacturers:

B. Insulation: ASTM C578; rigid closed cell.
1. 'K' value: 0.23 at 75 degrees F.
2. Maximum service temperature: 165 degrees F.
3. Maximum water vapor permeance: 5.0 perms

2.05 EXPANDED PERLITE

A. Manufacturers:
1. Schundler Company: www.schundler.com/#sle.

B. Insulation: ASTM C610, molded.
1. Maximum service temperature: 1200 degrees F.
2. Maximum water vapor transmission: 0.1 perm.

2.06 POLYISOCYANURATE CELLULAR PLASTIC

A. Insulation Material: ASTM C591, rigid molded modified polyisocyanurate cellular plastic.
1. Dimension: Comply with requirements of ASTM C585.
2. 'K' value: 0.18 at 75 degrees F, when tested in accordance with ASTM C518.
3. Minimum Service Temperature: -70 degrees F.
4. Maximum Service Temperature: 300 degrees F.
5. Water Absorption: 0.5 percent by volume, maximum, when tested in accordance with ASTM D2842..
6. Moisture Vapor Transmission: 4.0 perm in.
7. Connection: Waterproof vapor barrier adhesive.

2.07 POLYETHYLENE

A. Manufacturers:
1. Armacell International: www.armacell.com/#sle.

B. Insulation: Flexible closed-cell polyethylene tubing, slit lengthwise for installation, complying with applicable requirements of ASTM D1056.
1. 'K' value: ASTM C177; 0.25 at 75 degrees F.
2. Maximum Service Temperature: 200 degrees F.
3. Density: 2 lb/cu ft.

4. Maximum Moisture Absorption: 1.0 percent by volume.
5. Moisture Vapor Permeability: 0.05 perm inch, when tested in accordance with ASTM E96/E96M.
6. Connection: Contact adhesive.

2.08 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:
   1. Armacell International: www.armacell.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C 534 Grade 3;grade 2; grade 1 use molded tubular material wherever possible.
   1. Minimum Service Temperature: -40 degrees F.
   2. Maximum Service Temperature: 220 degrees F.
   3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.09 JACKETS

A. PVC Plastic.
   1. Manufacturers:
      a. Johns Manville Corporation: www.jm.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.
      c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 20 mil; 30 mil.
      e. Connections: Brush on welding adhesive, tacks, pressure sensitive color matching vinyl tape.
   3. Covering Adhesive Mastic:

B. ABS Plastic:
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: -40 degrees F.
      b. Maximum Service Temperature of 180 degrees F.
      c. Moisture Vapor Permeability: 0.012 perm inch, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 30 mil.
      e. Connections: Brush on welding adhesive.

C. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
   1. Lagging Adhesive:
      a. Compatible with insulation.

D. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
   1. Thickness: 0.016 inch, 0.020 inch sheet.
   2. Finish: Smooth, embossed.
   3. Joining: Longitudinal slip joints and 2 inch laps.
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
   6. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

E. Stainless Steel Jacket: ASTM A 666, Type 304 or 316 stainless steel.
   1. Thickness: 0.010 inch.
   2. Finish: Smooth.
   3. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

H. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

I. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.
   4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.

K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

L. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

M. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

N. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULES

3.04 INTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Domestic hot, recirculated hot water.
   1. Operating Temperature: 60 to 140 deg F.
   2. Insulation Material: Flexible elastomeric or glass fiber.
   3. Insulation Thickness: Apply the following insulation thicknesses:
      a. Pipe, All Sizes: 1.0 inch.
   4. Jacket:
      a. Exposed Spaces (mechanical rooms, closets, etc.) = PVC
      b. Concealed Spaces = None
   5. Vapor Retarder Required: No.
   6. Finish: None.

B. Service: Domestic cold water.
   1. Operating Temperature: 35 to 60 deg F.
   2. Insulation Material: Flexible elastomeric or glass fiber.
   3. Insulation Thickness: Apply the following insulation thicknesses:
      a. Pipe, 1” or less: 0.5 inch.
      b. Pipe, 1¼” to 2” : 0.5 inch.
      c. Pipe, 2-1/2” to 4”: 1.0 inch.
      d. Pipe, 5” and up : 1.0 inch.
   4. Jacket:
      a. Exposed Spaces (mechanical rooms, closets, etc.) = PVC
      b. Concealed Spaces = None
   5. Vapor Retarder Required: Yes.
   6. Finish: None.

C. Service: Rainwater conductors.
   1. Operating Temperature: 32 to 100 deg F.
   2. Insulation Material: Mineral fiber.
   3. Insulation Thickness: Apply the following insulation thicknesses:
      a. Pipe, 3” and up: 1.0 inch.
   4. Jacket:
      a. Concealed Piping - None
      b. Exposed Piping - PVC
   5. Vapor Retarder Required: Yes.
   6. Finish: None.

D. Service: Roof drain bodies.
   1. Operating Temperature: 32 to 100 deg F.
   2. Insulation Material: Mineral fiber.
   3. Insulation Thickness: 1.0 inch.
   4. Jacket:
      a. Concealed - None
      b. Exposed - PVC
   5. Vapor Retarder Required: Yes.
   6. Finish: None

E. Service: Sanitary waste piping where heat tracing is installed.
   1. Operating Temperature: 35 to 100 deg F.
   2. Insulation Material: Mineral fiber.
   3. Insulation Thickness: Apply the following insulation thicknesses:
      a. Pipe, 3” and up: 1.0 inch.
   4. Jacket: Aluminum.
   5. Vapor Retarder Required: Yes.
   6. Finish: None.

F. Service: Condensate drain piping.
   1. Operating Temperature: 35 to 75 deg F.
   2. Insulation Material: Flexible elastomeric.
   3. Insulation Thickness: 0.5 inch.
   4. Jacket: None.
   5. Vapor Retarder Required: Yes.
   6. Finish: None.

G. Service: Exposed sanitary drains and domestic water supplies and stops for fixtures for the disabled.
   1. Operating Temperature: 35 to 120 deg F.
   2. Insulation Material: Molded closed cell vinyl.
   3. Insulation Thickness: 3/16 inch.
   4. Vapor Retarder Required: No.
   5. Finish: None.

3.05 EXTERIOR INSULATION APPLICATION SCHEDULE

A. This application schedule is for aboveground insulation outside the building. Loose-fill insulation, for belowground piping, is specified in Division 2 piping distribution Sections.

B. Service: Domestic water.
   1. Operating Temperature: 60 to 180 deg F.
   2. Insulation Material: Cellular glass, with jacket
   3. Insulation Thickness: Apply the following insulation thicknesses:
      a. Pipe, 1” or less: 2.0 inch.
      b. Pipe, 1-1/4” and larger: 2.0 inch.
   4. Jacket: Aluminum.
   5. Vapor Retarder Required: No.
   6. Finish: None.

C. Service: Storm water.
   1. Operating Temperature: 32 to 100 deg F.
   2. Insulation Material: Flexible elastomeric.
   3. Insulation Thickness: Apply the following insulation thicknesses:
      a. Pipe, 1-1/4” to 2”: 0.5 inch.
      b. Pipe, 2-1/2” and up: 1.0 inch.
   4. Field-Applied Jacket: Aluminum.
   5. Vapor Retarder Required: Yes.
   6. Finish: None.

END OF SECTION

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SECTION 22 10 05
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.
   1. Sanitary sewer.
   2. Domestic water.
   3. Storm water.
   4. Gas.
   5. Flanges, unions, and couplings.
   6. Pipe hangers and supports.
   7. Ball valves.
   8. Valves.
   9. Flow controls.
   10. Check.
   11. Water pressure reducing valves.
   12. Relief valves.
   13. Strainers.

1.02 RELATED REQUIREMENTS

A. Section 31 23 16 - Excavation.

B. Section 31 23 23 - Fill.

C. Section 31 23 16.13 - Trenching.

D. Section 33 01 10.58 - Disinfection of Water Utility Piping Systems.

E. Section 07 84 00 - Firestopping.

F. Section 08 31 00 - Access Doors and Panels.

G. Section 09 90 00 - Painting and Coating.

H. Section 22 05 16 - Expansion Fittings and Loops for Plumbing Piping.

I. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

J. Section 22 07 19 - Plumbing Piping Insulation.

K. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

L. Section 33 01 10.58 - Disinfection of Water Utility Piping Systems.

1.03 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems; 2015.

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.

C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.

D. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2016.

E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2018.

F. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.

G. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; 2016.

H. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.

I. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; 2017.

J. ASME B31.1 - Power Piping; 2020.

K. ASME B31.2 - Fuel Gas Piping; The American Society of Mechanical Engineers; 1968.

L. ASME B31.9 - Building Services Piping; 2017.

M. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2019.

N. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fuzing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.

O. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).

P. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

Q. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2020.

R. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2019.

S. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

T. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2020.

U. ASTM B43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes; 2020.

V. ASTM B68/B68M - Standard Specification for Seamless Copper Tube, Bright Annealed; 2011.

W. ASTM B68M - Standard Specification for Seamless Copper Tube, Bright Annealed (Metric); 2011.

X. ASTM B75/B75M - Standard Specification for Seamless Copper Tube; 2020.

Y. ASTM B75M - Standard Specification for Seamless Copper Tube (Metric); 1999 (Reapproved 2005).

Z. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2020.

AA. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

AB. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2020.

AC. ASTM B302 - Standard Specification for Threadless Copper Pipe, Standard Sizes; 2017.

AD. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2020.

AE. ASTM C4 - Standard Specification for Clay Drain Tile and Perforated Clay Drain Tile; 2004 (Reapproved 2018).

AF. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe; 2020.

AG. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, Culvert Pipe (Metric); 2020.

AH. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2020.

AI. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric); 2020.

AJ. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings; 2004 (Reapproved 2018).

AK. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2020.

AL. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric); 2020.

AM. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.

AN. ASTM C700 - Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated; 2018.

AO. ASTM C1053 - Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications; 2000 (Reapproved 2015).

AP. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015, with Editorial Revision (2018).

AQ. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings; 2004 (Reapproved 2016).

AR. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter; 2012a.

AS. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2020.

AT. ASTM D2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter; 2003.

AU. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2017.

AV. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings; 2019.

AW. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020.

AX. ASTM D2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe; 2015.

AY. ASTM D2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings; 2014, with Editorial Revision (2018).

AZ. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2020.

BA. ASTM D2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping; 2001 (Reapproved 2014).

BB. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2014.

BC. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2017.

BD. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings; 2005.

BE. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems; 2019a.

BF. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020.

BG. ASTM D2996 - Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe; 2017.

BH. ASTM D2997 - Standard Specification for Centrifugally Cast "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe; 2015.

BI. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2016.

BJ. ASTM D3262 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe; 2020.

BK. ASTM D3517 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe; 2019.

BL. ASTM D3754 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer and Industrial Pressure Pipe; 2019.

BM. ASTM D3840 - Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Nonpressure Applications; 2019.

BN. ASTM F437 - Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2015.

BO. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40; 2017.

BP. ASTM F439 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2019.

BQ. ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; 2020.

BR. ASTM F442/F442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR); 2020.

BS. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe; 2014.

BT. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2020.

BU. ASTM F628 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core; 2012, with Editorial Revision (2018).

BV. ASTM F679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings; 2016.

BW. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2020.

BX. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems; 2020.

BY. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).

BZ. ASTM F1281 - Standard Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe; 2017.

CA. ASTM F1282 - Standard Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe; 2017.

CB. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011 (Amended 2012).

CC. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.

CD. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2012.

CE. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2017.

CF. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017, with Errata (2018).

CG. AWWA C651 - Disinfecting Water Mains; 2014.

CH. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution; 2016.

CI. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service; 2017.

CJ. AWWA C950 - Fiberglass Pressure Pipe; 2013.

CK. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2017 (Revised 2018).

CL. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2012 (Revised 2018).

CM. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.

CN. MSS SP-67 - Butterfly Valves; 2017.

CO. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.

CP. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends; 2011.

CQ. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; 2018.

CR. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; 2011.

CS. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.

CT. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; 2011.

CU. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.

CV. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

CW. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2012.

CX. NFPA 58 - Liquefied Petroleum Gas Code; National Fire Protection Association; 2014.

1.04 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

B. Project Record Documents: Record actual locations of valves.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with local standards.
   1. Maintain one copy on project site.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

D. Welder Qualifications: Certified in accordance with ASME (BPV IX).

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.06 REGULATORY REQUIREMENTS

A. Perform Work in accordance with local plumbing code.

B. Conform to applicable code for installation of backflow prevention devices.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.08 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

1.09 EXTRA MATERIALS

A. Provide two repacking kits for each size valve.

PART 2 PRODUCTS

2.01 SANITARY SEWER PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. PVC Pipe: ASTM D 3034 SDR 35. As permitted by code.
   1. Fittings: PVC.
   2. Joints: Push-on, using ASTM F477 elastomeric gaskets.

C. PVC Pipe: ASTM D 2665 or ASTM D 3034. As permitted by code.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight.
   1. Fittings: Cast iron.
   2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

2.03 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. PVC Pipe: ASTM D1785 Schedule 40, or ASTM D2241 SDR 26 for not less than 150 psi pressure rating.
   1. Fittings: ASTM D2466, PVC.
   2. Joints: Solvent welded, with ASTM D2564 Solvent cement.

2.04 WATER PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. Ductile Iron Pipe: AWWA C151/A21.51.
   1. Fittings: AWWA C110, ductile or gray iron, standard thickness.
   2. Joints: AWWA C111/A21.11, rubber gasket with 3/4 inch diameter rods.

B. Copper Pipe: ASTM B42, hard drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
   2. Joints: ASTM B 32, alloy Sn95 solder.

C. Copper Pipe: ASTM B42, annealed.
   1. Fittings: ASME B16.26, cast bronze.
   2. Joints: Flared.

2.05 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: ASTM B42, hard drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

2. Joints: ASTM B 32, alloy Sn95 solder.

B. Copper Pipe: ASTM B42, annealed.
1. Fittings: ASME B16.26, cast bronze.
2. Joints: Flared.

2.06 WATER PIPING, ABOVE GRADE

A. Piping 4" and greater: Copper Pipe: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.

B. Piping up to 3" Diameter: Cross-Linked Polyethylene (PEX-a) Pipe: ASTM F876 or ASTM F877.
1. Manufacturers:
a. Uponor, Inc: www.uponorengineering.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.
2. PEX-a Fittings: elbows, adapters, couplings, plugs, tees and multi-port tees (1/2 inch through 3 inch nominal pipe size): ASTM F1960 cold-expansion fitting manufactured from the following material types:
a. UNS No. C69300 Lead-free (LF) Brass.
b. UNS No. C27453 Lead-free (LF) Brass.
c. 20% glass-filled polysulfone as specified in ASTM D 6394.
d. Unreinforced polysulfone (group 01, class 1, grade 2) as specified in ASTM D 6394.
e. Polyphenylsulfone (group 03, class 1, grade 2) as specified in ASTM D 6394.
f. Blend of polyphenylsulfone (55-80%) and unreinforced polysulfone (rem.) as specified in ASTM D 6394.
g. Reinforcing cold-expansion rings shall be manufactured from the same source as PEX-a piping manufacturer and marked "F1960".
3. Pre-Sleeved Piping (1/2 inch (16mm) through 3/4 inch (20mm) nominal pipe size): PEX-a piping, with a high-density polyethylene (HDPE) corrugated sleeve.
4. Multi-Port Tees: Multiple-outlet fitting complying with ASTM F 877 (CAN/CSA B137.5); with ASTM F 1960 inlets and outlets.
a. Engineered polymer branch multi-port tee.
b. Engineered polymer flow-through multi-port tee.
c. Engineered polymer commercial branch multi-port tee.
d. Engineered polymer commercial branch multi-port elbow.
e. Engineered polymer commercial flow-through multi-port tee.
5. Manifolds: Multiple-outlet assembly complying with ASTM F 877 (CAN/CSA B137.5); with ASTM F 1960 outlets.
a. Engineered polymer valved manifold.
b. Engineered polymer valveless manifold.
c. Lead - free copper branch manifold.
d. Lead-free copper valved manifold.
6. PEX-to-Metal Transition Fittings:
a. Manufacturers: Provide fittings from the same manufacturer of the piping.
b. PEX-a to Thread Transition: One-piece brass fitting with male or female threaded adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
c. PEX-a to Copper Sweat Transition: One-piece brass fitting with sweat adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
d. PEX-a to Copper Press Transition: One-piece lead free (LF) brass fitting with one ASME B16.51 copper press end and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
e. PEX-a to Flange Transition: Two-piece fitting with one steel flange conforming to ASME B 16.5and one lead free (LF) brass adapter conforming to ASTM F 1960.

f. PEX-a to Groove Transition: One-piece lead free (LF) brass fitting with one CSA B242-05 groove end in either iron pipe size (IPS) or copper tube size (CTS) and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
g. PEX-a to Water Meter Transition: Two-piece fitting with one NPSM union thread and one ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.

7. PEX-to-Thermoplastic Transition Fittings:
   a. PEX-a to CPVC Transition: Thermoplastic fitting with one spigot or socket end and one ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
8. Provide (1) thermal coupling installation tool for all pipe sizes used at closeout of the project.

2.07 STORM WATER PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. Concrete Pipe: Nonreinforced, ASTM C14 (ASTM C14M) Class 1.
   1. Fittings: Concrete, as specified for pipe.
   2. Joints: Elastomeric gaskets; ASTM C443 (ASTM C443M).

C. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.08 STORM WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.09 STORM WATER PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74 service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.10 NATURAL GAS PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASTM A234/A234M, wrought steel welding type, with AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.
   2. Joints: ASME B31.1, welded.
   3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

2.11 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

1. Fittings: ASTM A234/A234M, wrought steel welding type.
2. Joints: ASME B31.1 or ASME B31.9, welded.
3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

2.12 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
   2. Joints: NFPA 54, threaded or welded to ASME B31.1 or ASME B31.9.

2.13 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:
   1. Ferrous pipe: Class 150 malleable iron threaded unions.
   2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch:
   1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
   2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Grooved and Shouldered Pipe End Couplings:
   1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
   2. Sealing gasket: "C" shape composition sealing gasket.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.14 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.

B. Plumbing Piping - Drain, Waste, and Vent:
   1. Conform to ASME B31.9.
   2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
   3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
   7. Vertical Support: Steel riser clamp.
   8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Plumbing Piping - Domestic Water (PEX-a):
   1. Horizontal PEX-a Piping Hangers: Install CTS hangers suitable for PEX-a piping in compliance with the Uponor Piping Pocket Guide (2017) and local codes, with the following maximum spacing:
      a. National Plumbing Code of Canada (NPCC): 3 inch (75mm) and below: Maximum span, 32 inches (0.81 m).

b. International Plumbing Code (IPC) & Uniform Plumbing Code (UPC): 1 inch (25 mm) and below: Maximum span, 32 inches (0.81 m).
c. IPC & UPC: 1-1/4 inch (31 mm) and above: Maximum span, 48 inches (1.2 m).
d. Note: The above maximum hanger spacing requirements may be extended with the use of a continuous support channel such as Uponor PEX-a Pipe Support.

2. Horizontal PEX-a Piping with PEX-a Pipe Channel: Install hangers for PEX-a piping with horizontal support channel in accordance with local jurisdiction and manufacturer's recommendations, with the following maximum spacing:
   a. 3/4 inch (20 mm) and below: Maximum span, 6 feet (1.8 m).
   b. 1 inch (25 mm) and above: Maximum span, 8 feet (2.4 m).
3. Vertical PEX-a Piping: Support PEX-a piping with maximum spacing of 5 feet (1.5 m).
4. PEX-a Riser Supports: Install CTS riser clamps at the base of each floor and at the top of every other floor for domestic hot-water systems. Install mid-story guides between each floor. Install CTS riser clamps at the base of each floor and at the top of every fourth floor for domestic cold-water systems. Install mid-story guides.

D. Plumbing Piping - Gas or other rigid systems
1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
6. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded supports or spacers and hanger rods, cast iron roll.
8. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
9. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
10. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
11. Vertical Support: Steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.15 GATE VALVES

A. Manufacturers:
1. Conbraco Industries: www.conbraco.com.
2. Nibco, Inc: www.nibco.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Up To and Including 3 Inches:
1. 1, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder ends.

C. 2 Inches and Larger:
1. 1, Class 125, iron body, bronze trim, outside screw and yoke, handwheel, solid wedge disc, flanged ends. Provide chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.16 GLOBE VALVES

A. Manufacturers:
   1. Conbraco Industries: www.conbraco.com.
   2. Nibco, Inc: www.nibco.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Up To and Including 3 Inches:
   1. 1, Class 125, bronze body, bronze trim, handwheel, bronze disc, solder ends.

C. 2 Inches and Larger:
   1. 1, Class 125, iron body, bronze trim, handwheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends. Provide chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.17 BALL VALVES - METALLIC PIPING

A. Manufacturers:
   1. Conbraco Industries: www.conbraco.com.
   2. Nibco, Inc: www.nibco.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

C. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder ends with union.

2.18 BALL VALVES - PEX-A

A. PEX-to-PEX, Lead Free (LF) Brass Ball Valves (1/2 inch (16 mm) through 2 inch (50 mm) nominal pipe size)
   1. Manufacturers: Provide ball valve(s) from the same manufacturer as the piping system.
   2. Full-port ball valve: two-piece, ASTM F1960 cold-expansion ends, with PEX-a reinforcing cold-expansion ring.
   3. LF brass valve with a positive stop shoulder manufactured from C69300 brass.
   4. In compliance with: 250 CWP, ANSI/NSF 359, ANSI/NSF 14/61, cNSF-us-pw_G lead free 0.25% Lead max., ASTM F1960, ASTM F 877 (CAN/CSA B137.5).

2.19 PLUG VALVES

A. Manufacturers:
   1. Conbraco Industries: www.conbraco.com.
   2. Nibco, Inc: www.nibco.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Construction 2-1/2 Inches and Larger: 1, 175 psi CWP, cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

2.20 BUTTERFLY VALVES

A. Manufacturers:
   1. Hammond Valve: www.hammondvalve.com.
   2. Crane Co.: www.cranevalve.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction 1-1/2 Inches and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM, Buna N, or EPT seat, wafer, lug, or grooved ends, extended neck, 10 position lever handle.

C. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.21 FLOW CONTROLS

A. Manufacturers:
   1. ITT Bell & Gossett: www.bellgossett.com.
   2. Griswold Controls: www.griswoldcontrols.com.
   3. Taco, Inc: www.taco-hvac.com.

B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi psi.

2.22 SWING CHECK VALVES

A. Manufacturers:
   1. Hammond Valve: www.hammondvalve.com.
   2. Nibco, Inc: www.nibco.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Up to 3 Inches:
   1. 1, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder ends.

C. Over 3 Inches:
   1. 1, Class 125, iron body, bronze swing disc, renewable disc seal and seat, flanged or grooved ends.

2.23 SPRING LOADED CHECK VALVES

A. Manufacturers:
   1. Hammond Valve: www.hammondvalve.com.
   2. Crane Co.: www.cranevalve.com.
   3. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Class 125, iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

2.24 WATER PRESSURE REDUCING VALVES

A. Manufacturers:
   1. Amtrol Inc: www.amtrol.com/#sle.
   2. Cla-Val Co: www.cla-val.com/#sle.
   3. Watts Regulator Company: www.wattsregulator.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Up to 2 Inches:
   1. MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single or double union ends.

C. Over 2 Inches:
   1. MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.25 RELIEF VALVES

A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

2.26 STRAINERS

A. Size 1/2 inch to 3 inch:
   1. Class 150, threaded forged bronze Y-pattern body, stainless steel perforated mesh screen with cap, and rated for 150 psi, 250 deg F WOG service.

B. Size 2 inch and Smaller:

1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

C. Size 1-1/2 inch to 4 inch:
1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

D. Size 5 inch and Larger:
1. Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

2.27 RELIEF VALVES

A. Pressure Relief:
1. Manufacturers:
a. Cla-Val Co: www.cla-val.com.
b. Henry Technologies: www.henrytech.com.
c. Watts Regulator Company: www.wattsregulator.com.
2. AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

B. Temperature and Pressure Relief:
1. Manufacturers:
a. Cla-Val Co: www.cla-val.com.
b. Henry Technologies: www.henrytech.com.
c. Watts Regulator Company: www.wattsregulator.com.
2. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME (BPV IV) certified and labelled.

2.28 STRAINERS

A. Manufacturers:
1. Armstrong International, Inc: www.armstronginternational.com.
2. Green Country Filter Manufacturing: www.greencountryfilter.com.
3. WEAMCO: www.weamco.com.

B. Size 2 inch and Under:
1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

C. Size 1-1/2 inch to 4 inch:
1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

D. Size 5 inch and Larger:
1. Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. All gas piping shall be painted standard ANSI yellow.

B. Install in accordance with manufacturer's instructions.

C. Pipe Joint Construction: PEX-a Connections: Install per manufacturer's recommendations. Use manufacturer-recommended cold-expansion tool for ASTM F 1960 connections.

D. Field Quality Control: Do not expose PEX-a piping to direct sunlight for more than 30 days. If construction delays are encountered, provide cover to portions of piping exposed to direct sunlight.

E. PEX-a shall not be installed in areas within five feet of UV light.

F. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

G. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

H. Install piping to maintain headroom, conserve space, and not interfere with use of space.

I. Group piping whenever practical at common elevations.

J. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 05 16.

K. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 19.

L. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 31 00.

M. Establish elevations of buried piping outside the building to ensure not less than 3 ft of cover.

N. Install vent piping penetrating roofed areas to maintain integrity of roof assembly .

O. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

P. Provide support for utility meters in accordance with requirements of utility companies.

Q. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 90 00.

R. Excavate in accordance with Section 31 23 16.

S. Backfill in accordance with Section 31 23 23.

T. Install bell and spigot pipe with bell end upstream.

U. Install valves with stems upright or horizontal, not inverted.

V. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

W. Install water piping to ASME B31.9.

X. Install fuel oil piping to ASME B31.9.

Y. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

Z. Sleeve pipes passing through partitions, walls and floors.

AA. Inserts:
1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

AB. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9.
2. Support horizontal piping as scheduled.

3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.
9. Prime coat exposed steel hangers and supports. Refer to Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
10. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 22 05 48.
11. Support cast iron drainage piping at every joint.

3.04 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

D. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Install globe valves for throttling, bypass, or manual flow control services.

F. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.

G. Provide spring loaded check valves on discharge of water pumps.

H. Provide plug valves in natural gas systems for shut-off service.

I. Provide flow controls in water recirculating systems where indicated.

3.05 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.06 FIELD TESTS AND INSPECTIONS

A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.

B. Domestic Water Systems:
   1. Perform hydrostatic testing for leakage prior to system disinfection.
   2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
   3. General:
      a. Fill the system with water and raise static head to 10 psi above service pressure. Minimum static head of 50 to 150 psi. As an exception, certain codes allow a maximum static pressure of 80 psi.
   4. Metal Piping Systems Subject to Freezing Conditions:
      a. Inject 40 psi of compressed air into piping to spot check for leaks with liquid soap. Document and repair leaks as necessary.
      b. Raise injected compressed air pressure to 1.5 times rated service pressure or minimum pressure of 100 psi for a duration of 2 hours and verify with a gauge that no perceptible pressure drop is measured.

C. Gas Distribution Systems:
   1. Test Preparation: Close each appliance valve or disconnect and cap each connected appliance.

2. General Systems:
    a. Inject a minimum of 10 psi of compressed air into the piping system for a duration of 15 minutes and verify with a gauge that no perceptible pressure drop is measured.
    b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound.
3. Welded Pipes or Systems with Service Pressures Above 14 in-wc:
    a. Inject a minimum of 60 psi of compressed air into the piping system for a duration of 30 minutes and verify with a gauge that no perceptible pressure drop is measured.
    b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound with 1 psi increments.

D. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.07 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with Section 33 01 10.58.

B. Prior to starting work, verify system is complete, flushed and clean.

C. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

F. Maintain disinfectant in system for 24 hours.

G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.08 SERVICE CONNECTIONS

A. Provide new sanitary and storm sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve.
    1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
    2. Provide 18 gage galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.

C. Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 7 inch wg. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

3.09 SCHEDULES

A. Pipe Hanger Spacing:
    1. Metal Piping:
        a. Pipe size: 1/2 inches to 1-1/4 inches:
            1) Maximum hanger spacing: 6.5 ft.
            2) Hanger rod diameter: 3/8 inches.
        b. Pipe size: 1-1/2 inches to 2 inches:
            1) Maximum hanger spacing: 10 ft.
            2) Hanger rod diameter: 3/8 inch.
        c. Pipe size: 2-1/2 inches to 3 inches:

1) Maximum hanger spacing: 10 ft.
2) Hanger rod diameter: 1/2 inch.

d. Pipe size: 4 inches to 6 inches:
1) Maximum hanger spacing: 10 ft.
2) Hanger rod diameter: 5/8 inch.

e. Pipe size: 8 inches to 12 inches:
1) Maximum hanger spacing: 14 ft.
2) Hanger rod diameter: 7/8 inch.

f. Pipe size: 14 inches and Over:
1) Maximum hanger spacing: 20 ft.
2) Hanger rod diameter: 1 inch.

2. Plastic Piping:
a. Pipe Size 1" to 6":
1) Maximum hanger spacing: 6 ft.
2) Hanger rod diameter: 3/8 inch.

b. Pipe Size 8" and Over:
1) Maximum hanger spacing: 6 ft.
2) Hanger rod diameter: 7/8 inch.

END OF SECTION

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SECTION 22 10 06
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof and floor drains.
B. Cleanouts.
C. Hydrants.
D. Backflow preventers.
E. Water hammer arrestors.
F. Interceptors.
G. Thermostatic mixing valves.
H. Catch basins and manholes.

1.02 RELATED REQUIREMENTS

A. Section 33 05 61 - Concrete Manholes.
B. Section 03 30 00 - Cast-in-Place Concrete: Manhole bottoms.
C. Section 22 10 05 - Plumbing Piping.
D. Section 22 40 00 - Plumbing Fixtures.
E. Section 22 30 00 - Plumbing Equipment.
F. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor and Trench Drains; 2019.
B. ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2008 (Reaffirmed 2012).
C. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2017.
D. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent; 2009.
E. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers; 2011.
F. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2011 (Reaffirmed 2016).
G. ASTM C478 - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections; 2019.
H. ASTM C478M - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections (Metric); 2019.
I. PDI-WH 201 - Water Hammer Arresters; 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
D. Certificates: Certify that grease or oil interceptors meet or exceed specified requirements.
E. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
F. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors.

G. Operation Data: Indicate frequency of treatment required for interceptors.

H. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

1.07 EXTRA MATERIALS

A. Supply for Owner's use in maintenance of project:
   1. Two loose keys for outside hose bibbs.
   2. Two hose end vacuum breakers for hose bibbs.

PART 2 PRODUCTS

2.01 DRAINS

A. Manufacturers:
   1. Josam Company: www.josam.com/#sle.
   2. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
   3. Zurn Industries, Inc: www.zurn.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Roof Drains:
   1. Assembly: ASME A112.6.4.
   2. Body: Lacquered cast iron with sump.
   3. Strainer: Removable polyethylene, cast metal, cast bronze, or cast iron dome with vandal proof screws.
   4. Accessories: Coordinate with roofing type.
      a. Membrane flange and membrane clamp with integral gravel stop.
      b. Adjustable under deck clamp.
      c. Roof sump receiver.
      d. Waterproofing flange.
      e. Controlled flow weir.
      f. Leveling frame.
      g. Adjustable extension sleeve for roof insulation.
      h. Perforated or slotted ballast guard extension for inverted roof.
      i. Perforated stainless steel ballast guard extension.

C. Parapet Drains:
   1. Lacquered or Galvanized cast iron body with aluminum flashing clamp collar and epoxy coated or nickel bronze sloping grate.

D. Canopy and Cornice Drains:
   1. Lacquered or Galvanized cast iron body with aluminum flashing clamp collar and epoxy coated or nickel bronze flat strainer.

E. Roof Overflow Drains:
   1. Lacquered or Galvanized cast iron body and clamp collar and bottom clamp ring; pipe extended to above flood elevation.

F. Downspout Nozzles:
   1. Bronze round with straight bottom section.

G. Area Drains:
   1. Assembly: ASME A112.6.4.
   2. Body: Lacquered cast iron with sump.
   3. Strainer: Round nickel-bronze.

4. Accessories: Membrane flange and membrane clamp with integral gravel stop, with adjustable under deck clamp, roof sump receiver, waterproofing flange, levelling frame, adjustable extension sleeve (for insulation), and perforated stainless steel ballast guard extension.

H. Floor Drain:
1. Round, type 304 stainless steel adjustable floor drain with anchor flange and medium-duty vertically adjustable satin finish top.

2.02 CLEANOUTS

A. Manufacturers:
1. Jay R. Smith Manufacturing Company: www.jayrsmith.com/#sle.
2. Josam Company: www.josam.com/#sle.
3. Zurn Industries, Inc: www.zurn.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Cleanouts at Exterior Surfaced Areas:
1. Round cast nickel bronze access frame and non-skid cover.

C. Cleanouts at Exterior Unsurfaced Areas:
1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.

D. Cleanouts at Interior Finished Floor Areas:
1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

E. Cleanouts at Interior Finished Wall Areas:
1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

F. Cleanouts at Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.03 HYDRANTS

A. Manufacturers:
1. Arrowhead Brass Company: www.arrowheadbrass.com/#sle.
2. Jay R. Smith Manufacturing Company: www.jayrsmith.com/#sle.
3. Zurn Industries, Inc: www.zurn.com/#sle.

B. Wall Hydrants: Exterior
1. ASSE 1019; tamper-proof, freeze resistant, self-draining type with chrome plated wall plate hose thread spout, handwheel, and integral vacuum breaker.

C. Roof Hydrant:
1. Freezeless, cast iron support components. Drain connection, EPDM Boot.

2.04 BACKFLOW PREVENTERS

A. Manufacturers:
1. Conbraco Industries: www.conbraco.com/#sle.
2. Watts Regulator Company: www.wattsregulator.com/#sle.
3. Zurn Industries, Inc: www.zurn.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Reduced Pressure Backflow Preventers:
1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

2.05 DOUBLE CHECK VALVE ASSEMBLIES

A. Manufacturers:
   1. Conbraco Industries: www.conbraco.com/#sle.
   2. Watts Regulator Company: www.wattsregulator.com/#sle.
   3. Zurn Industries, Inc: www.zurn.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Double Check Valve Assemblies:
   1. ASSE 1012; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

2.06 WATER HAMMER ARRESTORS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company: www.jayrsmith.com/#sle.
   2. Watts Regulator Company: www.wattsregulator.com/#sle.
   3. Zurn Industries, Inc: www.zurn.com/#sle.
   4. Souix Chief Company.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Water Hammer Arrestors:
   1. Stainless steel construction, bellows or piston type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

2.07 MIXING VALVES

A. Thermostatic Mixing Valves:
   1. Manufacturers:
      a. ESBE: www.esbe.se/en.
      b. Leonard Valve Company: www.leonardvalve.com.
      c. Honeywell Water Controls: http://yourhome.honeywell.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.
   3. Accessories:
      a. Check valve on inlets.
      b. Volume control shut-off valve on outlet.
      c. Stem thermometer on outlet.
      d. Strainer stop checks on inlets.
   4. Cabinet: 16 gage prime coated steel, for recessed mounting with keyed lock.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install approved portable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

F. Pipe relief from backflow preventer to nearest drain.

G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories, sinks, washing machines, toilets, urinal and any other quick closing valves .

END OF SECTION

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SECTION 22 13 13
FACILITY SANITARY SEWERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. PVC pipe and fittings.
   2. Cleanouts.
   3. Manholes.
   4. Concrete.

1.03 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Pipe and fittings.
   2. Cleanouts.

B. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

1.04 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:
   1. Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from sewer system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
   2. Show system piping in profile. Draw profiles to horizontal scale of not less than 1 inch equals 50 feet (1:500) and to vertical scale of not less than 1 inch equals 5 feet (1:50). Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

B. Product Certificates: For each type of pipe and fitting.

C. Field quality-control reports.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.06 FIELD CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
   1. Notify Owner and Construction Manager no fewer than three days in advance of proposed interruption of service. Interruption to businesses will not be permitted during normal business hours.
   2. Do not proceed with interruption of service without Owner or Construction Manager’s written permission.

PART 2 PRODUCTS

2.01 PVC PIPE AND FITTINGS

A. PVC Type PSM Sewer Piping:
   1. Pipe: ASTM D3034, SDR 26, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
   2. Fittings: ASTM D3034, PVC with bell ends.

3. Gaskets: ASTM F477, elastomeric seals.

B. PVC Pressure Piping:
1. Pipe: ASTM D1785, Schedule 40PVC, with plain ends for solvent-cemented joints.
2. Fittings: ASTM D2466, Schedule 40 PVC, socket type.

2.02 CLEANOUTS

A. Cast-Iron Covers:
1. Source Limitations: Obtain cast-iron cleanouts from single manufacturer.
2. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
3. Top-Loading Classification(s): Heavy Duty.

B. PVC Cleanouts:
1. Source Limitations: Obtain PVC cleanouts from single manufacturer.
2. Description: Mechanical type end of pipe gripper plug .

2.03 MANHOLES

A. Standard Precast Concrete Manholes:
1. Description: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
4. Base Section: 8-inch minimum thickness for floor slab and 6-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
a. Riser Sections: 6-inch minimum thickness, of length to provide depth indicated.
5. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
6. Joint Sealant: ASTM C990, bitumen or butyl rubber.
7. Resilient Pipe Connectors: ASTM C923, cast or fitted into manhole walls, for each pipe connection.
8. Steps: Individual rungs in vertical alignment at 12” spacing as per New Castle County Standard Details. Rung type shall be plastic coated using a minimum 1/2-inch diameter steel reinforcing rod meeting the requirements of ASTM A615 as a core. Plastic coating shall meet the requirements of ASTM 2146, Type II, Grade 4375B.
9. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope, not to exceed 24 inches.

B. Manhole Frames and Covers:
1. Description: Ferrous; 24-inch ID by 9-inch riser, with 5-inch- minimum-width flange and 25-7/8-inch diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
2. Material: ASTM A48, Class 308 iron unless otherwise indicated.

C. Manhole-Cover Inserts:
1. Description; Manufactured, plastic form, of size to fit between manhole frame and cover and designed to prevent stormwater inflow. Include handle for removal and gasket for gastight sealing.
2. Type: Solid.

2.04 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318 and the following:
1. Cement: ASTM C150, Type II.
2. Fine Aggregate: ASTM C33, sand.
3. Coarse Aggregate: ASTM C33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
   1. Reinforcing Fabric: ASTM A1064, steel, welded wire fabric, plain.
   2. Reinforcing Bars: ASTM A615, Grade 60 deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
   1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
      a. Invert Slope: 1 percent through manhole.
   2. Benches: Concrete, sloped to drain into channel.
      a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
   1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
   2. Reinforcing Bars: ASTM A615/A615M, Grade 60 deformed steel.

PART 3 EXECUTION

3.01 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 31 20 00 "Earth Moving."

3.02 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details to indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
   1. Install gravity-flow, nonpressure, drainage piping according to the following:

F. Install piping pitched down in direction of flow, at slope shown on construction plans. Minimum slope of 2 percent unless otherwise indicated.

G. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
   1. Install piping with 36-inch minimum cover.
   2. Install PVC Type PSM sewer piping according to ASTM D2321 and ASTM F1668.
   3. Install force-main, pressure piping according to the following:

H. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
   1. Install piping with 36-inch minimum cover.
   2. Install PVC pressure piping according to ASTM D2321 and ASTM F1668.

I. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.03 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:
   1. Join PVC Type PSM sewer piping according to ASTM D2321 and ASTM D3034 for elastomeric-seal joints or ASTM D3034 for elastomeric-gasket joints.
   2. Join dissimilar pipe materials with nonpressure-type, flexible couplings.

B. Join force-main, pressure piping according to the following:
   1. Join PVC pressure piping in accordance with ASTM D2855 for solvent-cemented joints.
   2. Join dissimilar pipe materials with pressure-type couplings.

3.04 MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C891.

C. Form continuous concrete channels and benches between inlets and outlet.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

E. Install manhole-cover inserts in frame and immediately below cover.

3.05 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.06 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Install piping so cleanouts open in direction of flow in sewer pipe.
   1. Use Heavy-Duty, top-loading classification cleanouts.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 26 by 26 by 8 inches deep. Set with tops flush with surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.07 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

B. Connect force-main piping to building's sanitary force mains specified in Section 221316 "Sanitary Waste and Vent Piping." Terminate piping where indicated.

C. Make connections to existing piping and underground manholes.
   1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
   2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
   3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of, and be flush with, inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.08 IDENTIFICATION

A. Comply with requirements in Section 312000 "Earth Moving" for underground utility identification devices. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.
1. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.09 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:
a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours advance notice.
4. Submit separate report for each test.
5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
a. Fill sewer piping with water. Test with pressure of at least 10-foot head of water and maintain such pressure without leakage for at least 15 minutes.
b. Close openings in system and fill with water.
c. Purge air and refill with water.
d. Disconnect water supply.
e. Test and inspect joints for leaks.
6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
a. Test plastic gravity sewer piping according to ASTM F1417.
b. Test concrete gravity sewer piping according to ASTM C1628.
7. Force Main: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 150 psig.
a. Ductile-Iron Piping: Test according to AWWA C600, "Hydraulic Testing" Section.
b. PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.
8. Manholes: Perform hydraulic test according to ASTM C969.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials and repeat testing until leakage is within allowances specified.

3.10 CLEANING

A. Clean dirt and superfluous material from interior of piping and flush with potable water.

END OF SECTION

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water closets.
B. Urinals.
C. Lavatories.
D. Sinks.
E. Service sinks.
F. Sinks.
G. Under-lavatory pipe supply covers.
H. Drinking fountains.
I. Shower receptors.
J. Bi-level, electric water coolers.
K. Mop sinks.

1.02 RELATED REQUIREMENTS

A. Section 07 90 05 - Joint Sealers: Seal fixtures to walls and floors.
B. Section 22 10 05 - Plumbing Piping.
C. Section 22 10 06 - Plumbing Piping Specialties.
D. Section 22 30 00 - Plumbing Equipment.
E. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
B. ANSI Z124.1 - American National Standard for Plastic Bathtub Units; 1995.
C. ANSI Z124.2 - American National Standard for Plastic Shower Units; 1995.
D. IAPMO Z124 - Plastic Plumbing Fixtures; 2017.
E. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2014.
F. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2013.
G. ARI 1010 - Self-Contained, Mechanically-Refrigerated Drinking-Water Coolers; Air-Conditioning and Refrigeration Institute; 2002.
H. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).
I. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.
J. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2017).
K. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures; The American Society of Mechanical Engineers; 2008 (R2011).
L. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018.
M. ASME A112.19.3 - Stainless Steel Plumbing Fixtures; 2017.
N. ASME A112.19.4M - Porcelain Enameled Formed Steel Plumbing Fixtures; 1994 (R2009).
O. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2017.

P. ASME A112.19.14 - Six Liter Water Closets Equipped with Dual Flushing Device; 2013 (Reaffirmed 2018).

Q. ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers; 2005.

R. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2015.

S. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2015.

T. IAPMO Z124 - Plastic Plumbing Fixtures; 2017.

U. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

V. NSF 61 - Drinking Water System Components - Health Effects; 2019.

1.04 SUBMITTALS

A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

B. Samples: Submit two sets of color chips for each standard color.

C. Manufacturer's Instructions: Indicate installation methods and procedures.

D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

E. Waterless Urinals: Submit recommended frequency of maintenance and parts replacement, methods of cleaning, sources of replacement supplies and parts.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.

1.06 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.07 MOCK-UP

A. Provide mock-up of typical bathroom group.

B. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.09 WARRANTY

A. Provide five year manufacturer warranty for electric water cooler.

1.10 EXTRA MATERIALS

A. Supply two sets of faucet washers, flush valve service kits, and lavatory supply fittings.

PART 2 PRODUCTS

2.01 FLUSH VALVE WATER CLOSETS

A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
   1. Flush Volume: 1.28 gallon, maximum.
   2. Flush Valve: Exposed (top spud).

3. Flush Operation: Sensor operated, push-button override or manual as noted in the plumbing schedule.
4. Handle Height: 44 inches or less. See schedule.
5. Manufacturers:
   a. American Standard Inc: www.americanstandard.com.
   b. Kohler.
   c. Toto USA: www.totousa.com.
   d. Zurn Industries, Inc: www.zurn.com/#sle.
   e. Substitutions: See Section 01 60 00 - Product Requirements.

B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
1. Sensor-Operated Type: Solenoid operator, battery powered with self-generating hydro-electric turbine, infrared sensor and over-ride push button.
2. Manual Operated:
   a. Type: ASME A112.18.1 or ASME A112.19.5; diaphragm type complete with vacuum breaker stops, and accessories.
   b. Supplied Volume Capacity: 1.5 gal per flush or as scheduled.
3. ASME A112.19.2; floor mounted, siphon jet or wall hung blow out vitreous china closet bowl, with elongated rim, 1-1/2 inch top spud, china bolt caps.
4. Manufacturers:
   a. Toto USA: www.totousa.com
   b. Sloan Valve Company: www.sloanvalve.com.
   c. Zurn Industries, Inc: www.zurn.com.
   d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Seats:
1. Manufacturers:
   a. Kohler
   b. Bemis Manufacturing Company: www.bemismfg.com/#sle.
   c. Church Seat Company: www.churchseats.com/#sle.
   d. Olsonite: www.olsonite.com/#sle.
   e. Substitutions: See Section 01 60 00 - Product Requirements.
2. Solid plastic, open front, extended back, brass bolts, with cover.

D. Water Closet Carriers:
1. Manufacturers:
   a. JR Smith.
   b. Sloan Valve Company: www.sloanvalve.com.
   c. Zurn Industries, Inc: www.zurn.com/#sle.
   d. Substitutions: See Section 01 60 00 - Product Requirements.
2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.02 WALL HUNG URINALS

A. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
1. Flush Volume: 1/8 gallon (0.5 liter).
2. Flush Style: Washout.
3. Trap: Integral.

B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
1. Sensor-Operated Type: Solenoid operator, battery powered with self-generating hydro-electric turbine, infrared sensor and over-ride push button.

C. Carriers:
1. Manufacturers:
   a. JR Smith

b. Sloan Valve Company: www.sloanvalve.com.
c. Zurn Industries, Inc: www.zurn.com/#sle.

2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.03 LAVATORIES

A. Lavatory Manufacturers:
1. American Standard Inc
2. Eljer
3. Kohler Company: www.kohler.com/#sle.
4. Zurn Industries, Inc: www.zurn.com/#sle.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Wall-Hung Basin:
1. Vitreous China: ASME A112.19.2; white, rectangular basin with splash lip, front overflow, soap depression, and hanger. Size as indicated on drawings with 4-inch centerset spacing.

C. Sensor Operated Faucet: Cast brass, chrome plated, deck mounted with sensor located on neck of spout.
1. Spout Style: Standard,
2. Power Supply:
a. Wired: 6 VDC, field-wired into dedicated or common power supply.
b. Wireless:
1) Battery: Replaceable alkaline or lithium type with 200,000 cycles, minimum.
2) Low Battery Warning: Provide red or yellow colored indicator to light periodically at 30 days of remaining capacity and continuously 2 weeks prior to get fully discharged.
3. Mixing Valve: automatic.
4. Water Supply: 1/2 inch compression connections.
5. Aerator: Vandal resistant, 0.5 GPM, .
6. Automatic Shut-off: 30 seconds.
7. GPC Default: 0.25
8. Sensor range: Automatically adjusts.
a. Accessory: Optional remote reprogrammer module to adjust pre-set factory functions.
9. Finish: Polished chrome.
10. Accessory: 4 inch or 8 inch deck plate.
11. Sensor Operated Faucet Manufacturers:
a. Krowne Metal Corporation
b. American Standard Inc: www.americanstandard.com.
c. Sloan Valve Company: www.sloanvalve.com/#sle.
d. Toto USA: www.totousa.com/#sle.
e. Zurn industries, Inc: www.zurn.com.

D. Thermostatic Mixing Valve:
1. ASSE 1070 listed with combination stop, strainer, and check valves, and flexible stainless steel connectors.

E. Accessories:
1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.
2. Offset waste with perforated open strainer.
3. Screwdriver stops.
4. Rigid supplies.
5. Carrier:
a. Manufacturers:
1) JR Smith
2) Sloan Valve Company: www.sloanvalve.com.
3) Zurn Industries, Inc: www.zurn.com/#sle.

b. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, or concealed arm supports bearing plate and studs.

F. Lavatory Carrier:
1. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.

2.04 SINKS

A. Undermount-Installed or Drop In Single or Double Compartment Bowl:
1. ASME A112.19.3, stainless steel, 18 gauge, 0.050 inch, type 304 stainless steel.
2. Bowl Proportion: Equally sized.
3. Drain: 3-1/2 inch, stainless steel with strainer, crumb cup, and tailpiece.

B. Kitchen-Style Faucets:
1. Single Handle Faucet with Three-Function Pulldown Spray Head:
a. Type: Deck-mount, swivel faucet with mounting plate.
b. Spray Functions: Stream, full spray and pause at 1.8 gpm, maximum.
c. ASME A112.18.1, ADA Standards, and NSF 61 compliant assembly.
d. Materials: Ceramic disc-cartridge valve on brass body with brushed nickel finish.

2.05 UNDER-LAVATORY PIPE SUPPLY COVERS

A. Basis of Design: Plumberex Specialty Products, Inc; www.plumberex.com/#sle.
1. Under-Lavatory Covers with Snap-Lock Fasteners (Molded): Plumberex Pro-Extreme.

B. General:
1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
2. Construction: 1/8 inch PVC with antimicrobial, antifungal and UV resistant properties.
a. Comply with ASTM C1822 Type III for covers on accessible lavatory piping.
b. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
c. Comply with ICC A117.1.
3. Color: High gloss white.
4. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.

2.06 SHOWERS

A. Cabinet: IAPMO Z124 molded cast acrylic, 39 by 38 by 82 inches with smooth finish, integral receptor, soap dish, manufacturer provided ADA folding shower seat, manufacturer provided grab bars, removable chrome-plated strainer, tail piece, white color. See drawings for final dimensions.

B. Shower Trim:
1. Single Handle: ASME A112.18.1; lever-handle operated, pressure balanced mixing valve with integral service stops, bent shower arm with adjustable spray ball joint shower head with maximum flow, and escutcheon.

C. Hand-Held Shower Head:
1. ASME A112.18.1, adjustable spray hand-held shower head with swivel fitting with ASSE 1014 backflow preventer.
2. Provide pushbutton flow control.
3. Include 60 inch minimum flexible polished stainless steel hose and in-line vacuum breaker
4. Provide 25 inch grab bar with sliding spray holder that locks at any height, allowing use of unit as either a hand-held spray or a fixed shower head.

D. Thermostatic Mixing Valve:
1. ASSE 1070 listed with combination stop, strainer, and check valves, and flexible stainless steel connectors.

E. Pressure Balancing Valve:

1. ASME A112.18.1, cast bronze, 6.3 gpm, rough-in ceramic disc cartridge shower valve with sweat connections.

2.07 WATER FOUNTAINS

A. Electric Water Cooler Manufacturers:
   1. Tri Palm International/Oasis: www.tripalmint.com.
   2. Elkay Manufacturing Company: www.elkay.com/#sle.
   3. Haws Corporation: www.hawsco.com/#sle.

B. Fountain:
   1. A surface handicapped-height, fully ADA compliant mounted water fountain with stainless steel top, stainless steel; stainless steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, bottle filling station, and mounting bracket. .
   2. Bottle Filler: Materials to match fountain.

2.08 BI-LEVEL, ELECTRIC WATER COOLERS

A. Manufacturers:
   1. Elkay Manufacturing Company; ezH20: www.elkay.com/#sle.
   2. Haws Corporation: www.hawsco.com/#sle.
   3. Oasis International: www.oasiscoolers.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Water Cooler: Bi-level, electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
   1. Capacity: 8 gph of 50 degrees F water with inlet at 80 degrees F and room temperature of 90 degrees F, when tested in accordance with ASHRAE Std 18.
   2. Electrical: 115 VAC, 60 Hertz compressor, 6 foot cord and plug for connection to electric wiring system including grounding connector.

C. Bottle Filler: Materials to match fountain.

2.09 MOP SINKS

2.10 SERVICE SINKS

A. Service Sink Manufacturers:
   1. Kohler
   2. Elkay Manufacturing Company: www.elkay.com/#sle.

B. Bowl:
   1. White floor mounted, with one inch wide shoulders. Vinyl bumper guard stainless steel strainer.

C. Trim:
   1. ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

D. Accessories:
   1. 5 feet of 1/2 inch diameter plain end reinforced plastic or rubber hose.
   2. Hose clamp hanger.
   3. Mop hanger.

2.11 HOSE BIB BOXES

A. Material: 316 stainless steel.

B. Finish: Satin.

C. Mount in wall fully recessed.

D. Provide with NPT PVC ball valves and fittings.

E. Provide with internal hose drain bracket and waste outlet.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with screwdriver stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports or wall carriers and bolts.

E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 90 05, color to match fixture.

F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

A. Clean plumbing fixtures and equipment.

END OF SECTION

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SECTION 22 51 13
SWIMMING POOL PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Base Bid applies to this Section.

1.02 SUMMARY

A. The extent of the interconnecting piping from the main drain boxes, filtered water return inlets, and return piping is indicated on the Drawings. The Pool Contractor shall supply and install all piping to hook up to the filtration system and all related water feature distribution systems.

B. The Drawings indicate the general arrangement of all recirculation piping. The Pool Contractor shall carefully examine the Drawings and shall be responsible for the proper fitting and materials and equipment as indicated, without substantial alteration.

C. All connection work to the filter installation is to be provided by the Pool Contractor.

D. The recirculation piping work includes providing all pipe fittings, gaskets, and flanged pipe connections from each element of the specified system.

E. Any item of equipment or materials obviously a part of the recirculation system and necessary to its operation, but not specifically mentioned in the Specifications or shown on the Drawings shall be furnished and installed by the Pool Contractor as a part of his work at no extra cost.

F. Coordinate all grounding/bonding of the system and other similar and related items with the Electrical Contractor.

G. The Pool Contractor shall bond in accordance with the National Electrical Code and all local codes and ordinances.

1.03 QUALIFICATIONS OF CONTRACTOR

A. The Pool Contractor must have had at least five (5) years' experience in the construction of the type of recirculation piping herein specified and shall provide a list of at least five (5) projects of this type which he has constructed and which upon investigation, would be found to be completed in a satisfactory manner and in operation at least two (2) years. The State of Delaware requires Pool Contractors to maintain a Class B or Class A license, if work is not performed under a General Contractor's Class A license.

B. The Owner reserves the right to reject any Contractor if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such Contractor is properly qualified to carry out the obligations of the Contract and to complete the work described, or if the Contractor does not meet the qualifications stated herein.

C. Installation shall be performed by mechanics with industry certification for all Schedule 80 PVC and Schedule 80 CPVC piping 2" diameter and larger, including adhesive applications.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, anchor details and installation Instructions for the products used in this assembly. Submit detailed shop drawings for the different service applications, pipe size, and joint type along with compatible cement and primer per service application, size applicable for service, and curing instructions.

B. Where materials or fabrication are indicated, comply with requirements to ensure proper water circulation rate, material properties. Supply complete information to the Architect.

1.05 WARRANTY

A. The Pool Contractor warrants that all materials used in completing the installation contracted for are new and of high quality; that all work has been done in a competent and workmanlike manner; that if any substantial defect occurs in the workmanship or materials, it will be

remedied without cost to the Owner if written notice thereof is given to the Pool Contractor within one (1) year from the Date of Substantial Completion.

1.06 QUALITY ASSURANCE

A. Field Measurements: The Pool Contractor will be responsible for checking measurements in the field prior to the preparation of Shop Drawings and actual fabrication of the system. Field fitting may be allowed only if measurements will delay the fabrication process.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. General: Schedule 80 PVC piping specified throughout the Project for all piping. Any piping in contact with the pool heating elements, (flat plate heat exchangers and heat recovery compressor) shall be Schedule 80 CPVC extending from the main recirculation return piping back to the source of the heating equipment. All CPVC piping shall be adequately supported to prevent heat related sag in strict accordance with the manufacturer's written recommendations.

B. Fittings for plastic pipe: Wherever PVC plastic pipe is used, all fittings shall be heavy weight Class 200, Schedule 80 PVC of the same manufacturer as PVC pipe used by the Pool Contractor. Assembly of fittings and pipe shall be proper and capable of developing full strength of the piping system. No schedule 40 PVC will be permitted in any application subject to exposure to pool water

C. Wall penetration fitting to accept threaded connections: All transition fittings are to be produced by Spears Manufacturing Company form PVC Type I, Cell Classification 12454, or CPVC Type IV, Cell Classification 23447. All transition fittings shall contain a mounded in place threaded metal inset conforming to ANSI B1.20.1 internal tapered pipe thread dimensions with internal

D. O-rings seal. For use with all new water feature returns, reflecting line termination, etc.

2.02 PIPE MARKERS

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Install pipe markers per manufacturer's instructions.

C. Identify fluid being conveyed, and include direction of flow arrows as indicated:
   1. Language: English
   2. Lettering: Size and color in accordance with ASME A13.1

D. Identify piping 20 mm (3/4 inch) diameter and smaller with tags.

E. Provide wrap-around vinyl self-adhesive pipe markers:
   1. Vinyl: Factory fabricated vinyl, 0.13mm (5 mil) thick, preformed to fit around pipe or pipe covering. Model: Opti-Code by Seton.

F. Install wrap-around pipe markers completely around pipe.

G. Install in clear view and align with axis of piping.

H. Locate identification at maximum 48" centers on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

2.03 FINISH FITTINGS

A. Return Outlet: Aquastar Flush Mount Return Fitting with Waterstop, Eyeball and Nut, Model #JE3101B, or equal.

B. Reflecting Line Cover: Aquastar 1.5" Safety Grate Insert, Model CFM101, or equal.

C. Skimmer Units: Hayward SP-1082 FVE or Aquastar Flowstar SKR1401xxx white color with flush face 4" extension, polymer and PVC construction rate from 15 to 90 GPM or approved equal.

PART 3 EXECUTION

3.01 GENERAL

A. Pipe and accessories shall be handled in such a manner as to insure delivery to the trench in sound, undamaged condition.

B. Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Cutting shall be done by means of mechanical cutter.

C. Before installation, pipes and converters shall be inspected for defects. The interior of the pipe shall be thoroughly cleaned of foreign matter and shall be kept clean during laying operation. Pipe shall not be laid in water or when trench or weather conditions are unsuitable for the work. Water shall be kept out of the trench until the pipe is installed. When work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth, or other substance will enter the pipes or fittings.

D. No installation shall be made that will provide a cross connection or inter-connection between a distributing supply for drinking purposes and the water recirculation system that will permit a backflow of water into the domestic water system.

E. Pipe openings shall be closed with caps or plugs during installation. Equipment and fittings shall be tightly covered and protected against dirt, water and chemical or mechanical injury. At the completion of the work, the fittings, materials, and equipment shall be thoroughly cleaned and adjusted for proper operation.

F. All pipe hangers shall be stainless steel.

3.02 JOINTS

A. Mechanical joints: Assemble all mechanical joints by washing the socket and plain ends of the pipe with soapy water. Then the gland and gasket shall be slipped over the plain end in such manner that the small side of the gasket and the lip side of the gland face the socket. The gasket shall then be painted with soapy water. Insert the plain end into the socket and push the gasket into position so that it is evenly seated. Slide the gland into position, insert stainless steel bolts and tighten stainless steel nuts by hand. Using a ratchet wrench, tighten stainless steel bolts alternately bottom and top and continue around pipe until the joint is bottle-tight under all working pressures.

B. Solvent-welded joints: Solvent-welded joints shall be made in accordance with the manufacturer's recommendations. However, the following directions are considered minimum standards. All fittings shall fit easily on the pipe before applying cement. The outer surface area of pipe and inner wall of fitting shall be clean and dry. Thinner is to be applied to the outer surface of the pipe and to the inner surface of the fittings. Cement is to be applied to the outer surface of the pipe, or on the male section of fitting only. When the outside surface area of the pipe end is satisfactorily covered with cement, allow ten (10) seconds open time to elapse before inserting pipe into fittings, turn fitting about the pipe end approximately 1/8 to 1/4 of a turn. Wipe off excess cement at the joint in a neat cover bead. Use only approved cement and thinners for making joints.

C. All joints shall remain completely undisturbed for a minimum of ten (10) minutes from time of joining the pipe and fitting. If necessary to apply pressure to a newly made joint, limit of ten (10) percent of rated pipe pressure, four (4) hours after joining, for the first twenty-four (24) hours after the joint has been made.

D. Carefully handle all pipe and move as little as possible so that the cement seal shall not be broken before it is completely dry and for a time of at least twenty-four (24) hours.

E. Full working pressure shall not be applied until the joints have been set for a twenty-four (24) hour period.

F. Installation made during hot weather shall provide for expansion by snaking in ditch or running line on open discharge until it contracts to operating length.

G. Protect plastic pipe from exposure to aromatic hydrocarbons, halogenated hydrocarbons and most esters and ketones that attack the material. Protect all pipe from mechanical damage and long exposure to sunlight during storage.

H. All connections between PVC and metal pipes must be flanged, plastic flange to metal flange. DO NOT use threaded connections between plastic and metal pipe, except where specifically noted otherwise and in which case the PVC pipe shall be Class 200 weight regardless of size.

3.03 FLUSHING OF LINES

A. All system piping lines shall be thoroughly flushed clean before the filtration system is placed in use.

3.04 INSPECTION SERVICES

A. The Pool Contractor shall supply the services of a competent and experienced field engineer for a period of at least two (2) days to inspect the completed installation, place the system into operation, and give operative instructions to the Owner's staff relative to its proper care and use.

END OF SECTION

SECTION 22 51 16
SWIMMING POOL PUMPS

PART 1 - GENERAL

1.01 INTENT

A. To install a complete filtration and recirculation system for the proposed swimming pool. It is the intent of the specification to limit the bidding to a style of product and company that has a proven history and record of performance, availability, and rapid delivery of replacement components.

B. Base Bid applies to this Section.

C. Due to the specialized nature of certain components required for this project, these specifications, in some instances, refer to various components by trade or manufacturers name.

D. Whenever a proprietary (trade) name is used within this specification section, it is used for informational purposes to describe a standard of required function, dimension, appearance and quality. References to materials by trade name, make or model number shall not be construed as limiting competition. All bidders are required to bid on the named manufacturer in the base bid. The Contractor may at his option, elect to propose products and/or services of alternate manufacturers if the procedures for substitution as outline in these specifications are properly followed.

1.02 SUBSTITUTIONS

A. Other recirculation pump systems will be considered only if a complete set of drawings and specifications detailing such equipment as it pertains to this project are submitted for evaluation ten (10) days prior to the bidding. The submission should include a list of five (5) operating installations within a reasonable distance of the jobsite. List should include the names and telephone numbers of the operating personnel. The technical contents of the submittal shall include hydraulic calculations, equipment fabrication details, filter room layout in plan and elevation views, warranties, installation and operating instructions.

B. Substitutes meeting the terms and conditions of the bidding documents will be acknowledged prior to bidding by addendum. No substitutions will be considered after the bid.

C. For any and all substitutes approved in accordance with the above conditions, state the amount to be DEDUCTED from the BASE BID if a substitute filtration system is being offered. No provision has been or will be made for ADDITIVE bids.

D. No substitutions will be considered unless the specified product becomes unavailable due to no fault of the Contractor.

1.03 QUALITY ASSURANCE

A. Due to the specialized nature of the specified work and products, all bidders shall be required to have a minimum of five (5) years of operating history. The equipment described herein shall be products of a manufacturer regularly engaged in the fabrication of filtration and recirculating systems for at least fifteen (15) years and shall be a professional engineering corporation.

1.04 GUARANTEE

A. The equipment supplier shall guarantee that the equipment to be furnished is of the correct capacity, that the various parts are designed to operate correctly and in conjunction with each other, that if the installation is made in accordance with the project drawings and operated in accordance with the suppliers instructions, the system will perform the prescribed functions

B. correctly, the water entering the pool will be clear, bright, free from suspended matter visible to the unaided eye, and will be sanitary to the satisfaction of all authorities having jurisdiction.

1.05 SUBMITTALS

A. Provide detailed shop drawings of the items of equipment being provided, indicating the dimensions, material of the equipment, valves, actuators, RMF programmer & accessory component's if applicable.

B. Provide a complete set of operating instructions, embracing the operational functions and recurring maintenance processes involved in connection with the complete filtration system.

1.06 WARRANTIES

A. Unless otherwise specified, workmanship is to be guaranteed first class and carry a one (1) year warranty.

PART 2 PRODUCTS

2.01 PUMPS AND STRAINERS

A. Pump and Motor - Base Bid irregular shaped therapeutic pool with a leisure area, variable depth, total system volume 12,663 gallons, 105.5 GPM, 2-hour turnover, TDH 62.5’ to TDH 64’.

B. Furnish and install one (1) Speck horizontal Badu pump, model number: BADU PRO-V CVS with integral strainer, 2.7 THP, 115/230 V, 60 cycle, 3 phase pump, desired flow

C. 105.5 GPM, stainless steel impeller (verify), 4” suction, and 4” discharge. Provide Neptune Benson “Greendrive”, Pentair “Accudrive”, or Speck independent variable frequency drive to match specific pump requirements, or equal.

2.02 ADJUSTABLE PUMP BASE

A. The adjustable pump base shall be designed with an adjustment range from 7” to 11 1/2", adjustment in .5” increments.

B. The pump bases shall be fabricated of 8-gauge T304 stainless steel.

C. All stainless-steel hardware shall be included for height adjustment, motor mounting and floor anchors.

D. A rubber vibration isolator shall be included for installation between motor and motor base.

E. The pump base shall be coated in 20-25 mils of electrostatically applied powder coat.

PART 3 EXECUTION

3.01 GENERAL

A. Equipment shall be handled in such a manner as to ensure delivery to the field of work in sound, undamaged condition.

B. Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Cutting shall be done by means of mechanical cutter.

C. Before installation, pipe shall be inspected for defects. The interior of the pipe shall be thoroughly cleaned of foreign matter and shall be kept clean during laying operation. Pipe shall not be laid in water or when trench or weather conditions are unsuitable for the work. Water shall be kept out of the trench until the pipe is installed. When work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth, or other substance will enter the pipes/fittings.

D. No installation shall be made that will provide a cross connection or inter-connection between a distributing supply for drinking purposes and the swimming pool that will permit a backflow of water into the pool water system.

E. Pipe openings shall be closed with caps or plugs during installation. Equipment and pool fittings shall be tightly covered and protected against dirt, water and chemical or mechanical injury. At the completion of the work, the fittings, materials, and equipment shall be thoroughly cleaned and adjusted for proper operation.

3.02 JOINTS

A. Mechanical joints: Assemble all mechanical joints by washing the socket and plain ends of the pipe with soapy water. Then the gland and gasket shall be slipped over the plain end in such manner that the small side of the gasket and the lip side of the gland face the socket. The gasket shall then be painted with soapy water. Insert the plain end into the socket and push the gasket into position so that it is evenly seated. Slide the gland into position, insert bolts and

tighten nuts by hand. Using a ratchet wrench, tighten bolts alternately bottom and top and continue around pipe until the joint is bottle-tight under all working pressures.

B. Threaded joints: After cutting and before threading pipe, shall be reamed and shall have burrs removed. Screw joints shall be made with graphite or inert filter and oil or with an approved graphite compound applied to male threads only. Threads shall be full-cut and not more than three threads on the pipe remain exposed. Caulking of threaded joints to stop or prevent leaks will not be permitted. Unions shall be provided where required for disconnection of exposed piping. Unions will be permitted where access is possible.

C. Solvent-welded joints: Solvent-welded joints shall be made in accordance with the manufacturer's recommendations. However, the following directions are considered minimum standards. All fittings shall fit easily on the pipe before applying cement. The outer surface area of pipe and inner wall of fitting shall be clean and dry. Thinner is to be applied to the outer surface of the pipe and to the inner surface of the fittings. Cement is to be applied to the outer surface of the pipe, or on the male section of fitting only. When the outside surface area of the pipe end is satisfactorily covered with cement, allow ten (10) seconds open time to elapse before inserting pipe into fittings, turn fitting about the pipe end approximately 1/8 to 1/4 of a turn. Wipe off excess cement at the joint in a neat cover bead...

D. Joints shall remain completely undisturbed for a minimum of ten (10) minutes from time of joining the pipe and fitting. If necessary to apply pressure to a newly made joint, limit of 10% of rated pipe pressure, four (4) hours after joining, for the first twenty-four (24) hours after the joint has been made.

E. Carefully handle all pipe and move as little as possible so that the cement seal shall not be broken before it is completely dry and for a time of at least twenty-four (24) hours.

F. Full working pressure shall not be applied until the joints have been set for a twenty-four (24) hour period.

G. Installation made during hot weather shall provide for expansion by snaking in ditch or running line on open discharge until it contracts to operating length.

H. Protect plastic pipe from exposure to aromatic hydrocarbons, halogenated hydrocarbons and most esters and ketones that attack the material. Protect all piping from mechanical damage and long exposure to sunlight during storage.

I. Make threaded pipe joints with Permatex #2 compound or approved equal, applied sparingly to the male threads only.

J. All connections between PVC and metal pipes must be flanged, plastic flange to metal flange. DO NOT use threaded connections between plastic and metal pipe, except where specifically noted otherwise and in which case the PVC pipe shall be Class 200 weight regardless of size.

K. Label all filtration equipment and piping. No painting of non- ferrous PVC piping is required.

3.03 FLUSHING OF LINES

A. All piping lines leading to the pool shall be thoroughly flushed clean prior to filling the pool.

3.04 POOL START UP

A. The Contractor shall supply the services of an experienced Manufacturer representative for a period of not less than three (3) days after the filtration and recirculation system has been initially placed in operation. The Contractor shall be on hand during all manufacturer directed training in the event any modification or alteration to the system is required. During this period, the Owner's designated representatives shall be thoroughly instructed in all phases of the pool's operation

B. Prior to this Manufacturer leaving the job, the Contractor shall obtain written certification from the Owner's designated representative acknowledging that the instruction period has been completed and all necessary operating information provided.

C. The Contractor shall, in his contract, include the cost of three (3) days of an on-site technician during the instruction and operational check-out performed by a qualified Manufacturer’s

representative during the first season's operation. One inspection shall be performed within the one- year anniversary date of the established date of substantial completion.

D. Written reports of each of these three (3) visits outlining the pool's operation, competence and performance of the pool's operating personnel and other pertinent comments shall be submitted to the Owner and Architect within one (1) week after each visit.

END OF SECTION

SECTION 22 51 19
SWIMMING POOL WATER TREATMENT EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 RELATED WORK

A. Filtration system for the pool, including recirculation pumps (see Section 22 51 16), saline chlorination system, ORP/pH controller, flow meters, including all piping, gauges, and valves.

B. pH balance equipment.

C. Water service for pool.

D. The General Contractor's licensed electrical contractor shall be responsible for the installation of all line and high voltage electrical circuits associated wit his section. All low voltage connections and line voltage "plug and play" connections shall be by the swimming pool contractor for all related equipment furnished and installed within this contract.

1.03 GENERAL REQUIREMENTS

A. Furnish and install all specified items as indicated on the Drawings and Specifications to provide a complete and fully functioning and operational facility. This specification covers the products and execution of fabrication and installation of equipment utilized in maintaining proper water chemistry (orp & ph) for use in sanitizing water. The entire system and all related components shall be of modular design and shall be supplied as one integrated package from a single source to the greatest extent possible.

B. The sanitation system shall consist of a liquid sanitizing delivery system, programmable automated water chemistry controller with modem capabilities. All controls, fuses, switches, gauges, valves, piping, and tubing for these components shall be included. In addition, a hydroxyl radical advanced oxidation system shall be installed on the filtered water return line between the filter bank and the pool perimeter recirculation system. All required valves, bypass configurations, electrical low-voltage service and connections shall be furnished by the contractor. This equipment shall effectively remove and eliminate combined chlorine compounds within the recirculation system.

C. All sanitation equipment shall be safety interlocked with the swimming pool recirculation pump. In the event of a loss of flow, all sanitation equipment shall immediately be placed in a non-functional state using dry contactors or other appropriate electronic controls. This function is to protect all bathers, staff and temperature sensitive equipment and sanitizing chemical feed equipment.

D. The sanitation system is to be a part of a combined and integrated disinfection/control system including saline chlorination, secondary sanitation, pH adjustment, and ORP/pH control.

E. Provide all necessary supervision, templates, manuals of operation, and turnover instructions.

1.04 SUBMITTALS

A. Manufacturer's Data:
   1. Submit a PDF copy of bound Manufacturer's specifications and installation instructions for products supplied for installation. Include certified laboratory test reports on components as specified or required by regulatory agencies.
   2. Assemble information into one (1) coordinated submittal.

B. Maintenance Manuals
   1. Include four (4) full maintenance and operating instructions, parts lists, recommended spare parts and emergency parts inventory, chemical treatment and supply list and recommended stock, sources of purchase and similar information with the maintenance manual for entire filtration system. Coordinate this data with the information provided by the successful manufacturer of the filtration system.

2. Assemble information into one (1) coordinated submittal.

1.05 WARRANTY

A. Filter shall carry a five (5) year limited warranty as regularly offered by the tank manufacturer.

B. Internal piping shall carry a three (3) year warranty.

C. Valve bodies shall carry a five (5) year fully rated warranty.

D. Valve operators and system accessories including the RMF controller, quick exhaust valve, and solenoid valve shall carry a one-year warranty as provided by the product manufacturer.

E. Unless otherwise specified, workmanship is to be guaranteed first class and carry a one (1) year warranty.

F. The automated chemistry control system shall carry a one-(1) year warranty on all components. The warranty on related equipment shall also carry a one-(1) year limited warranty. A detailed warranty shall be supplied.

G. A factory trained representative of the manufacturer shall perform all warranty work.

H. Manufacturers must maintain spare or replacement parts in the USA for same day or no longer than next day's delivery.

I. A Service Agreement from a qualified factory certified distributor shall be provided to initiate and maintain the five-year warranty.

1.06 REGULATORY AGENCY REQUIREMENTS

A. The entire system shall be designed and installed to meet all applicable State and Local codes.

B. Nationally recognized standards, as applicable, shall be adhered to including applicable provision of the Model Aquatic Health Code (MAHC), pending adoption.

PART 2 PRODUCTS

2.01 BASIS-OF-DESIGN FILTER SYSTEM

A. The filter system under this section shall be a Neptune Benson Defender Assero Model SP-29-36-200 as detailed in the drawings.

B. It is the intent of these specifications to describe a filter system complete with all accessory items supplied and warranted by one manufacturer.

C. The primary components of the system consist of the main filter tank, flex tube filter elements, element assembly, bump mechanism, vacuum transfer system, sight glass, pressure gauge panel, inspection (viewing) window, valves, pressure transducers & RMF system controller.

D. All components and related sub-assemblies shall be factory assembled and tested prior to shipment.

2.02 FILTER SYSTEM CAPACITY

A. The filter system shall have a capacity of filtering 12,663 gallons in 2.0 hours at a rate of 105.5 gallons per minute.

B. The system shall consist of One SP-29-36-200 Defender filter tank with a total effective filter surface area of 117 square feet and operate at a rate of .90 gallons per minute per square foot of filter area.

C. The filter area shall be provided as specified and as listed in NSF-Standard 50 to provide the specific filter rate. No modification, manipulation or interpretation of these values shall be permitted.

D. Filter system shall be designed to maximize sq. ft. of filter area while minimizing operating weight. Systems that operate more than 11 lbs. per sq. ft. of filter area shall not be considered.

2.03 FILTER TANKS

A. The filter tank shall not be less than 33" in diameter with a 60" side shell, suitable for 50 psi working pressure and hydrostatically tested to 75 psi. Tank shell shall be not less than 3/16"

thick. Bottom dished head shall be not less than ¾" thick. Top flat head shall be not less than 3/16" thick. All material shall be Type A-36 carbon steel.

B. NOTE: Tanks constructed of alternate materials shall not be considered.

C. All welding shall be performed by qualified operators. Joints shall be butt or fillet welded inside and out by manual or automatic process. Welded joints shall have complete penetration and fusion with little or no reduction of the thickness of the base metal. Welds shall be free of coarse ripples, grooves, overlaps, abrupt ridges, or valleys. All welded surfaces shall be chipped and brushed clean, when necessary, leaving no slag or splatter.

D. Tank legs shall be constructed of 6" x 2 ½" channel legs ¼" thick. 33" filter shall have (3) legs. The material shall be Type A-36 carbon steel. Bearing plates shall be 10" x 5" x 1/2" type 304L stainless steel. Each bearing plate shall have (2) 11/16" drilled holes to secure to the floor with the 5/8"x 8 ½" stainless steel concrete anchors provided. The legs shall be designed with bolted connections to minimize overall tank height for shipping and access into the mechanical room.

E. The tank head shall be bolted to the shell with 7/8" diameter T304 stainless steel bolts, nuts, and washers, 9" on center around the tank perimeter.

F. Tank shall be equipped with a UL listed grounding lug.

G. Tank shall incorporate connections for 3" filter influent, 3" effluent, 3" drain; 1-1/2" vacuum transfer piping. Tank shall include a 12" diameter access port with cover, 6" viewing window, hardware to facilitate cleaning of tube elements and interior inspection of filter and lift shaft gland.

H. Tank shall include brackets for mounting of RMF System controller, gauge panel, filter / regulator, vacuum transfer blower, and vacuum hose rack.

I. Tank shall include an integrally mounted hydraulic lifting device (davit). The davit assembly shall be designed to lift the filter head and include a pivot mechanism allowing the head to rotate 180°, for access to the tube sheet.

2.04 FLEXSOL 3000 INTERIOR LINING

A. All interior surfaces shall be grit blasted to white metal condition with a 3-4 mil profile. Blasted surfaces shall be cleaned of all dust or blast residue. Lining shall be applied as soon as is practical on the same day blasting is done.

B. Flexsol 3000® shall be a urethane, 100% solid plural component lining. Hardness shall be 75 durometer on the shore D scale. Break tensile strength shall be 4000 psi with elongation of less than 10%. Adhesion shall be greater than 2500 psi.

C. Application of Flexsol 3000® lining shall be done by experienced applicators using a high pressure, high temperature plural component system. All wetted surfaces including flange faces, manway rings and manway covers shall be lined to 100 mils +/- 10 mils WFT.

D. Hardness shall be verified after curing to ASTM D 2240 standard.

E. Manufacturer shall submit for approval a sample piece of coated steel to determine flexibility, abrasion tolerance and adhesion integrity.

F. Flexsol 3000® lining shall meet the NSF toxicity standard unconditionally and shall be approved for use with the NSF approved filter.

G. Flexsol 3000® lined vessels shall carry a ten (10) year limited non-prorated warranty.

H. The filter manufacturer shall bear the responsibility for suitability of lining and shall be the sole source for the specified warranty.

2.05 EXTERIOR COATINGS

A. All exterior surfaces shall be grit blasted to white metal condition with a 2-3 mil profile. Blasted surfaces shall be cleaned of all dust or blast residue.

B. Two coats of high solids enamel shall be applied for a total developed film thickness of 5-8 mils.

C. Manufacturer is to supply min.16 oz of high solids enamel touch-up paint.

2.06 INTERNAL COMPONENTS

A. The filter shall consist of flex tube elements, filter tube sheet, stainless steel lift shaft and internal flow diversion assembly.

B. The filter elements shall be flexible tubes that provide the support structure for the media. The outer wall of each element shall be fabricated of multi-filament high strength polyester braid. Each element shall have an internal T316 stainless steel spring, which acts as a support structure for the braided filament.

C. The filter element tube sheet shall be fabricated of T304 stainless steel and provide both support for the top of the element assembly as well as watertight seal to prevent media from escaping the filter tank.

D. The lift shaft shall be fabricated from T304 stainless steel and provide the internal connection between the filter element tube sheet and the external bump mechanism.

E. The filter influent connection shall be fitted with a T304 stainless steel flow diversion assembly to eliminate disturbance to the filter elements during operation.

F. All stainless-steel wetted fasteners shall be Type 304.

2.07 BUMP MECHANISM

A. The bump mechanism shall include a pneumatically operated tire mounted externally on the filter tank head. The tire is alternately pressurized then depressurized causing the connected filter element assembly to move in a downward then upward fashion. This movement shall provide the means of dislodging the media and accumulated solids, which then recoat the filter element.

B. NOTE: Systems that do not incorporate a pneumatic bump mechanism shall not be considered.

2.08 VACUUM TRANSFER SYSTEM

A. The vacuum transfer system shall be provided to allow the recharging of media into the filter for either bag or bulk media.

B. The vacuum shall include a 5 peak HP 115V or 230V single phase motor 60 Hz or 50 Hz, cULus listed.

C. Vacuum shall be supplied with mating electrical connections pre-wired into RMF System controller for field final connection in a pre-assembled junction box.

D. Provide three (3) 1-1/2” SCH 80 PVC ball valves: for the vacuum drain line, the blower inlet, and the vacuum hose.

E. The Manufacturer shall provide all necessary pipe, fittings, and hardware for field plumbing of the vacuum transfer system.

F. Provide 1-1/2” vacuum hose with required fittings.

2.09 RMF SYSTEM CONTROLLER

A. The automatic controller shall provide total control of the system's filtration and regeneration cycles and provide all necessary equipment interlocks and timing mechanisms to execute the filter program.

B. The controller shall contain at least two microprocessors that will monitor all functions of the system.

C. The controller shall also contain control the operation of the following functions:

Standard Features

1. Bump cycle / manual or automatic; with or without security interlock for data logging
2. Pre-coating of the filter elements
3. Stopping and starting of the main recirculation pump
4. Opening and closing of pneumatically operated valving
5. Vacuum transfer system
6. Heater cool down delay

7. Auxiliary contacts to interlock UV lamps, chemical control, or other equipment
8. 7-inch Hi-Res LCD Screen with Tactile Feedback Membrane
9. Last Bump™ and Bump-n-Go™ Features
10. Remote Operation via browser or phone
11. Off Site Real-Time Status
12. Email on change of condition
13. Data logging of process
14. Differential Pressure Monitoring and Bump Control
15. Exporting of process data logs to .csv Excel™ files
16. Modbus Communications for PLC connectivity

D. The controller panel shall display the following functions:
1. Filter status
2. Precoat status
3. Last Bump
4. Recirculating pump status
5. Vacuum transfer pump status
6. System power
7. Low Pressure Alarm
8. Recirculating Pump Off Alarm
9. Pressure Differential
10. Flow Rate (operational feature when interlocked with VFD)
11. Step by step animated graphics

E. The controller enclosure shall be NEMA 4x/IP66 approved system.

F. The RMF controller will provide signal power to the main recirculating pump motor starter. The unit is required to be a variable frequency drive (VFD) and is to be installed with control wiring by the General Contractor's electrical contractor.

G. The RMF shall be 120V/230V, 1 phase, 20 amp rated and shall be UL/CE labeled.

H. NOTE: Systems without programmable, automatic bump/regeneration/filter modes shall not be considered.

I. Options
1. Automated Main Drain and Purge Line Control Package
2. 24/7/365 Data Monitoring and Activity Package
3. Automated EZ Strainer Control for UV Systems.

2.10 VFD

A. One Variable Frequency Drive (VFD) shall be provided with the Defender for control of the filter pump motor. See Section 22 51 16 Swimming Pool Pumps. Features and functions outlined in this Section apply.

B. The Variable Frequency Drives (VFDs) shall be solid state, with a Pulse Width Modulated (PWM) output. The VFD package as specified herein shall be enclosed in a NEMA 12 enclosure, completely assembled, programmed, and tested by the manufacturer. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC induction motors. The VFD shall be a six-pulse input design. The VFD shall be of a PWM output design utilizing current IGBT inverter technology and voltage vector control of the output PWM waveform and shall output a waveform that closely approximates a sine wave.

C. Option for Single Phase input: The VFD shall convert incoming fixed frequency single-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC induction motors. The VFD shall be UL-listed for Single Phase operation. De-rating the VFD for operation on other than UL-labeled voltages shall not be acceptable. The VFD shall be a six-pulse input design. The VFD shall be of a PWM output design utilizing current IGBT inverter

D. technology and voltage vector control of the output PWM waveform and shall output a waveform that closely approximates a sine wave.

E. The VFD shall utilize VVCPLUS, an output voltage-vector switching algorithm, or equivalent, in both variable and constant torque modes. VVCPLUS provides rated RMS fundamental voltage from the VFD. This allows the motor to operate at a lower temperature rise, extending its thermal life. VFD's that cannot produce rated RMS fundamental output voltage or require the input voltage to be increased above motor nameplate value to achieve rated RMS fundamental output voltage are not acceptable. VFD's that utilize Sine-Coded PWM or Look-up tables shall not be acceptable.

F. An Automatic Energy Optimization (AEO) selection feature shall be provided in the VFD to minimize energy consumption in variable torque applications. This feature shall optimize motor magnetization voltage and shall dynamically adjust output voltage in response to load, independent of speed. Output voltage adjustment based on frequency alone is not acceptable for single motor VT configurations.

G. An Automatic Motor Adaptation (AMA) function shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to spin the motor shaft or de-couple the motor from the load to accomplish this optimization. Additionally, the parameters for motor resistance and motor reactance shall be user programmable.

H. Run permissive circuit shall be provided to accept a "system ready" signal to ensure that the VFD does not start until isolation valves, seal water pumps or other types of auxiliary equipment are in the proper state for VFD operation. The run permissive circuit shall also be capable of sending an output signal as a start command to actuate external equipment before allowing the VFD to start.

I. All Green Drive VFDs shall be factory programmed per the unique requirements of each job per Neptune Benson specifications. Programming shall include but shall not be limited to filter pump, remote start/stop requirements, run confirm requirements and PID loop requirements.

J. VFDs and options shall be UL, CUL, and CE labeled as a component.

K. Harmonic Distortion Control:
   1. The VFD shall provide internal DC link reactors to minimize power line harmonics and to provide near unity power factor. DC Link reactor shall be installed so that power fluctuations to the DC Capacitors shall be reduced to increase Capacitor life. VFDs without a DC link reactor shall provide a 5% impedance line side reactor and provide spare capacitors.

L. Specifications:
   1. Input voltage 208, VAC +/- 10%, 3 phase, 48-63 Hz.
   2. Voltage tolerance + 10% or – 15% of specified line voltage.
   3. Output Frequency 0 to 300 Hz. Operation above 60 Hz shall require programming changes to prevent inadvertent high-speed operation.
      a. Environmental operating conditions: -10 to 50°C, 0 to 1000 meters above sea level, less than 90% humidity, non-condensing.
      b. Enclosure shall be rated NEMA 12 or as specifically mentioned elsewhere.

M. The VFD shall be wired into the RMF system controller to provide remote for on/off and run confirm functions. Wiring shall be by electrical contractor.

N. The VFD shall be a Green Drive series or Speck Vacon provided all requirements outlined herein are provided by the Speck Unit.

O. The VFD shall be equipped with a bypass. Bypass option shall send the motor to bypass mode based on an easily accessible door-mounted selector or based on the drive's programmable relay. A bypass pilot light shall provide indication of the bypass mode. The bypass mode shall provide overload protection. Contactors shall be electrically and mechanically interlocked. An essential services mode shall send the motor to bypass regardless of the selected mode.

P. The bypass enclosure shall be equipped with a circuit breaker/disconnect switch.

2.11 FILTER MEDIA

A. Media shall be expanded perlite with a median particle size of 37 microns. Percentage retained on a +150 Tyler Mesh shall not be less than 8% or more than 25%. Darcy permeability shall be between 1.2-1.85.

B. The media shall contain no more than 1 tenth of one percent (.001) of crystalline silicate.

C. The media shall be certified by the Manufacturer for use in the Defender Filter. The media shall be NSF Std. 50 listed.

D. Filter Media: Aquapearl 25# bags 2.8 CU FT/bag Swimming Pool Perlite Filter Media 9 pounds of media per charge (< 1 bags per charge). Provide a total of 10 bags of media for initial start up and operation for the one filter array.
   1. Each filter tank shall be provided with the media sizes and quantities as per the manufacturer's recommendations.

2.12 FACE PIPING VALVES

A. Filter manufacturer shall supply piping and valves required in filter tank to carry out all normal functions of filter including bump and pre-coating operations, beginning with a connection for pump discharge and ending with a discharge connection for lines to waste and return to pool. Valves shall be epoxy coated cast iron bodied wafer type butterfly valves with stainless steel shaft and nylon coated disc.

2.13 BACKWASH /WASTE REMOVAL SYSTEM

A. When design flow rate can no longer be maintained, media shall be manually removed from the filter tank to the adjacent floor sump. Backwash flow rate shall be approximately 62 GPM 3" diameter at gravity flow of 3 FPS and shall be directed to waste. Process shall be manual by valved assembly. Model SP-29 has a maximum capacity of the filter vessel of 181 gallons. A sump pit or standpipe is required for dumping spent media and rinsing tube elements.

B. To prevent overflowing the sump, drain piping should be sized for 300 gpm capacity.

2.14 FLOWMETER

A. A digital flowmeter shall be included with a 4-20mA 0-10 VDC analog output. Unit shall be Blue White Model F2000 Series digital flow meter or approved equal.

B. The flowmeter shall be wired into the VFD to provide automatic speed control of the filter pump motor.

C. The VFD shall compensate for varying filter head losses by maintaining the specified flowrate with the 4-20mA output signal of the flowmeter.

2.15 FILTER / REGULATOR

A. Each filter shall include a combination filter / regulator. The regulator shall be adjustable from 0 - 120 p.s.i. 1/2" F.P.T. connections shall be provided for field installation of airlines.

2.16 WATER SEPARATOR

A. One water separator with automatic drain shall be included for each air compressor supplied. 1/2"

B. F.P.T. connections shall be provided for field installation of airlines.

2.17 AIR COMPRESSOR

A. The system will require (1) air compressor per mechanical room. The following is the minimum requirement:
   1. 20-gallon tank, 2 HP 115v, 1 phase, 15-amp, 5.2 CFM @ 90 psi, air pressure gauge, pressure relief valve, belt guard, pressure switch, air filter, tank drain.

B. PNEUMATIC ACTUATORS
   1. Each filter shall include pneumatic actuators for (1) effluent valve and (1) precoat valve.
   2. The actuators shall be double acting with valve mounted drilling to ISO 5211.

3. The actuators shall include (2) 1/8” or 1/4" FPT ports for open / close connections. Flow control valves with quick connect fittings shall be provided at each port to allow speed control adjustment for the open / close function of the actuators.
4. Materials of Construction
    a. Body: aluminum alloy, extruded acc. to ASTM 6063, anodized acc. to UNI 4522
    b. Ends: Die-cast in aluminum alloy acc. To ASTM B179, epoxy-polyester coated
    c. Pistons: Die-cast in aluminum alloy acc. To ASTM B179
    d. Pinion: Nickel-plated steel
    e. Slideways: Acetal resin (LAT LUB 731320T)
    f. Fasteners: AISI 304 Stainless steel
    g. Springs: Zinc phosphate coated steel, pre-compressed
    h. Seals: NBR Nitrile rubber
    i. Lubricant: MoS2
    j. The actuators shall be factory lubricated to allow for 1,000,000 maneuvers.
    k. The actuators shall have adjustable travel stops for both directions.
    l. Working temperature limits: 4ºF to 186ºF. NOTE: Systems utilizing manually operated valves shall not be considered.
    m. A tool kit for adjustment of pneumatic actuators shall be provided by the filter manufacturer.

2.18 SOLENOID VALVES

A. Each filter shall include three (3) single solenoid, 4-way valves mounted on a multi-station manifold for operation of the pneumatic actuators and bump mechanism.

B. The solenoids valves shall include lighted DIN connectors.

C. The solenoid valves shall be factory lubricated and shall not require any field lubrication.

D. The solenoid valves with multi-station manifold shall be located on the bottom of the automatic controller, factory wired and include quick connect fittings for attachment to the pneumatic actuators and bump mechanism.

E. The solenoid valves shall be SMC Series SY 7000.

2.19 VALVES

A. All valves 3” – 12” shall be constructed with cast aluminum ASTM B179S12C housing and fully coated with Rilsan on all interior and exterior surfaces. Internal components include EPDM resilient lining, Rilsan coated ductile iron disc and T304 stainless steel shaft. Valves 14” and larger shall be constructed with cast iron housing epoxy coated and with nylon coated ductile iron disc.

B. Valves shall be butterfly valves and shall be provided for the influent, effluent and precoat lines.

2.20 SYSTEM VALVES

A. Each defender filter shall include Five (5) system valves to facilitate system fill after media recharge, precoat/regeneration, influent & effluent for filtering and media dump/drain valve.

B. The precoat/regeneration and effluent valves shall be butterfly type with pneumatic actuators per 2.15.

C. The system fill valve shall be butterfly type with lever operator and shall be the same size as the precoat/regeneration valve.

D. The influent valve shall be a wafer type check valve, ductile iron body w/double disc, SS type 304, epoxy coated.

E. The dump/rinse valve shall be butterfly type, lever operated with SS extension to facilitate operation.

2.21 PACKAGING

A. For loading and unloading, filter tank diameters 24” – 41” shall be bolted to individual wooden pallets. All tanks shall be shrink wrapped to prevent damage during transport. All filter piping and valves shall be factory assembled and knocked down into sub-assemblies for shipment.

B. The components shall be carefully packaged in a totally enclosed wooden crate to prevent damage during transport.

2.22 REDUCERS

A. Concentric/Eccentric reducers shall be constructed of Sch. 80 PVC with Sch. 80 PVC van stone flanges. Units shall be equipped with influent/effluent connections as indicated on the Drawings. Fiberglass units by the filter manufacturer are also acceptable.

B. Reducer connections shall be ANSI standard dimension.

C. Reducers shall be designed for 100 psi operating pressure.

2.23 AUTOMATIC MAKE-UP WATER LEVEL CONTROL

A. Make-up Water Level Controller to be mounted in location indicated on the construction drawings.

2.24 CONTROLLER WLC-200

A. Water level shall be maintained by an automatic water level controller. Unit shall be Neptune Benson Model WLC-200 water level controller, WCL 100 also acceptable, or approved equal. Optical water level sensing probes are an acceptable alternative for main pool water level control.

B. Controller package shall consist of a bracket mounted 3 probe sealed housing, 3 stainless steel probes, a 2” clear plastic probe chamber with mounting clamps, to be interfaced with the surge/balance tank to permit water level control within the pool mechanical room. An electronic water level sensor is acceptable and will be considered an equal.

C. Water level shall be controlled by a three-probe electrode system, high level, low level, and ground. A mechanical linkage or float operated system will not be considered equal.

D. A 1.5” PVC line shall be connected to the bottom and top of the sensing chamber affixed to the balance tank wall to reflect the water level in the sensing vessels.

E. Wiring from the probes shall be connected to the relay that is mounted within a corrosion- free, non-metallic NEMA 4X enclosure. The enclosure size shall be no less than 8" wide x 10" high x 5" deep. The access door shall be the entire front face of the enclosure with a vertically mounted stainless-steel hinge equal to the full height of the door. Stainless steel hasps with locking loop latch shall be permanently secured to the enclosure.

F. Mounted within the enclosure shall be a liquid level relay, adjustable delay timer, 24-hour clock/timer and terminal board. Major components shall be plug-in type for instant replacement without wiring. Unit shall be suitable to activate any 110-volt circuit for solenoid valve, for providing domestic makeup water.

G. All wiring connections shall be made through the bottom of the enclosure.

H. Solenoid valve shall be 1½" N.C., slow closing.

2.25 CHEMISTRY CONTROLLER

A. Manufacturer: Subject to compliance with requirements, provide appropriate products from one of the following: controllers, flow cells, flow safety switch, injection equipment and related components shall be by Wallace and Tiernan (Evoqua/Neptune Benson) BECSys, Prominent, or approved equal. Note: Contractor may submit products from other manufacturers provided a price for one of the approved specified controller is provided. i.e., The Pool Warden controller may be considered provided adequate service and maintenance assistance for the Owner is available.

B. True PPM, ORP, pH Automated Controller: Neptune Benson Blue Sentinel SE, or BECSys5 or approved equal.

1. Furnish with all required accessories, i.e., automatic chlorine and pH control, flow cell, flow switch, pH and HHR Sensors, etc. Install one controller per pool. Include the following optional features: true ppm sensor; flow meter; surge tank level switch; pH level sensor; Cl2 level sensor; impact motor control variable frequency drive; direct connect, data modem and Ethernet; email alarm notification; remote access and control.

C. Controller shall include the following components:
   1. Sensors: The sensor measurements have the following characteristics.
      a. Chemical sensors shall be isolated from each other and from the supply voltage and ground.
      b. pH: 4.22 to 9.78
      c. ORP: 0 to 988 mV
      d. PPM: 0 to 9.5
      e. Temp: 32 °F to 122 °F
   2. Flow switch: When flow is stopped, there shall be no supplied voltage to the sensor and the controller shall turn off all relays.
   3. Relays: Include 2 digital inputs, (1 configurable), 3 10A assignable, 2 assignable digital outputs.
   4. Display: 40 Character LCD display, 2 LEDs.
   5. Buttons: Include a membrane overlay with 16 built-in touch buttons.
   6. Alarm: The chemical alarms shall come on when the measurements are out of tolerance for over a duration of sixteen (16) minutes.
   7. Proportional Feed: The feed time shall be reduced as the chemical value approaches the set-point.

D. Data Recording: Automatically record data every three (3) hours.

E. Warranty

F. The manufacturer shall warranty the system for five (5) years. All sensors and flow cells shall have a warranty of two (2) years.

G. Flow Cell (bypass line assembly) 1 required. The Flow Cell shall include the sensors, in-line filter, a flow switch, a visual flow rate indicator, and a sampling valve for water testing.
   1. The flow cell shall also include a valve at the inlet and outlet that may be used to adjust or stop the flow.
   2. The Flow Cell shall be designed such that it is not possible for the sensors to be exposed to air.

2.26 SALTWATER CHLORNE GENERATING SYSTEM

A. The commercial saline chlorination system shall be a ChlorKing, CHLOR 2MSM, reverse polarity, single cell chlorine generator capable of 2 pounds of chlorine (hypochlorous acid) / 24 hours delivery rate. NSF 50 certified, UL-108. Electrode stack 1-20lb, in clear housing. Power supply, 120V 50/60 Hz, 4 amps @120V, single phase. 15 Amp GFCI breaker required. ChlorKing Inc. 6767 Peachtree Industrial Boulevard, Norcross GA 30092 800-536-8180.

B. Power supply: 9”W x 12”H

C. Cell housing: 7”W x 16”H, 15,000-hour cell life
   1. salt concentration 3,500-5,000 ppm required
   2. 1” inlet /outlet @ 20 GPM, 50 psi maximum pressure

D. Furnish and install saline chlorination system in strict compliance with manufacturers written installation instructions, Bonding of all system components mandatory. Bonding lugs and grounding Ts included with system

PART 3 - EXECUTION

3.01 GENERAL

A. The manufacturer shall coordinate the delivery of all necessary anchors and fittings to avoid any delays in the scheduling of the Project.

B. The manufacturer shall supply all templates in a timely manner to facilitate the smooth progress of construction. A qualified representative from the manufacturer, whose cost shall be the responsibility of the Pool Contractor, will be present at the site to supervise the installation of his products, and to allocate a minimum of two (2) working days to supervise the start-up and

C. turnover of the facility as well as instructing the Owner's representatives in the operation and maintenance of all equipment.

D. The Manufacturer/Pool Contractor shall supply the necessary materials including all necessary ozone resistant tubing. The standard installation kit shall include a minimum of 25' of tubing, check valves, fittings, and hose clamps, furnish sufficient lengths of tubing to complete the installation at no additional cost to Owner. The Manufacturer shall supply the necessary materials including all necessary ozone resistant tubing.

E. A complete Installation, Operations and Maintenance Manual shall be provided for each element of system.

F. Contractor shall provide all startup chemicals and system balancing as required.

3.02 JOINTS

A. Mechanical joints: Assemble all mechanical joints by washing the socket and plain ends of the pipe with soapy water. Then the gland and gasket shall be slipped over the plain end in such manner that the small side of the gasket and the lip side of the gland face the socket. The gasket shall then be painted with soapy water. Insert the plain end into the socket and push the gasket into position so that it is evenly seated. Slide the gland into position, insert bolts and tighten nuts by hand. Using a ratchet wrench, tighten bolts alternately bottom and top and continue around pipe until the joint is bottle-tight under all working pressures.

B. Threaded joints: After cutting and before threading pipe shall be reamed and shall have burrs removed. Screw joints shall be made with graphite or inert filter and oil or with an approved graphite compound applied to male threads only. Threads shall be full-cut and not more than three threads on the pipe remain exposed. Caulking of threaded joints to stop or prevent leaks will not be permitted. Unions shall be provided where required for disconnection of exposed piping. Unions will be permitted where access is possible.

C. Solvent-welded joints: Solvent-welded joints shall be made in accordance with the manufacturer's recommendations. However, the following directions are considered minimum standards. All fittings shall fit easily on the pipe before applying cement. The outer surface area of pipe and inner wall of fitting shall be clean and dry. Thinner is to be applied to the outer surface of the pipe and to the inner surface of the fittings. Cement is to be applied to the outer surface of the pipe, or on the male section of fitting only. When the outside surface area of the pipe end is satisfactorily covered with cement, allow ten (10) seconds open time to elapse before inserting pipe into fittings, turn fitting about the pipe end approximately 1/8 to 1/4 of a turn. Wipe off excess cement at the joint in a neat cover bead.

D. Joints shall remain completely undisturbed for a minimum of ten (10) minutes from time of joining the pipe and fitting. If necessary, to apply pressure to a newly made joint, limit of 10% of rated pipe pressure, four (4) hours after joining, for the first twenty-four (24) hours after the joint has been made.

E. Carefully handle all pipe and move as little as possible so that the cement seal shall not be broken before it is completely dry and for a time of at least twenty-four (24) hours.

F. Full working pressure shall not be applied until the joints have been set for a twenty-four (24) hour period.

G. Installation made during hot weather shall provide for expansion by snaking in ditch or running line on open discharge until it contracts to operating length.

H. Protect plastic pipe from exposure to aromatic hydrocarbons, halogenated hydrocarbons and most esters and ketones that attack the material. Protect all piping from mechanical damage and long exposure to sunlight during storage.

I. Make threaded pipe joints with Permatex #2 compound or approved equal, applied sparingly to the male threads only.

J. All connections between PVC and metal pipes must be flanged, plastic flange to metal flange. DO NOT use threaded connections between plastic and metal pipe, except where specifically noted otherwise and in which case the PVC pipe shall be Class 200 weight regardless of size.

K. Label all filtration equipment and piping. No painting of non- ferrous PVC piping is required.

3.03 FLUSHING OF LINES

A. All system piping lines leading to the pool shall be thoroughly flushed clean prior to filling the pool.

3.04 POOL START UP

A. The Pool Contractor shall supply the services of an experienced Manufacturer representative for a period of not less than four (4) days after the filtration system has been initially placed in operation. The Pool Contractor shall be on hand during all manufacturer-directed training in the event any modification or alteration to the system is required. During this period, the Owner's designated representatives shall be thoroughly instructed in all phases of the pool's operation.

B. Prior to this Manufacturer leaving the job, the Pool Contractor shall obtain written certification from the Owner's designated representative acknowledging that the instruction period has been completed and all necessary operating information provided.

C. The Pool Contractor shall, in his contract, include the cost of three (3) days of an on-site technician during the instruction and operational check-out performed by a qualified Manufacturer’s representative during the first season’s operation. One inspection shall be performed within the one-year anniversary date of the established date of substantial completion.

D. Written reports of each of these three (3) visits outlining the pool's operation, competence and performance of the pool's operating personnel and other pertinent comments shall be submitted to the Owner and Architect within one (1) week after each visit.

END OF SECTION

SECTION 23 05 13
MOTOR REQUIREMENTS FOR HVAC AND PLUMBING EQUIP

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General construction and requirements.

B. Applications.

C. Single phase electric motors.

D. Three phase electric motors.

1.02 RELATED REQUIREMENTS

A. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

B. Section 26 29 13 - Enclosed Controllers.

1.03 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015.

B. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; 2017.

C. NEMA MG 1 - Motors and Generators; 2014.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. National Grid "Motor-Up" Rebate Program/Initiative.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

C. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 1/2 horsepower.

D. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

E. Operation Data: Include instructions for safe operating procedures.

F. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture of electric motors for HVAC use, and their accessories, with minimum three years documented product development, testing, and manufacturing experience.

B. Conform to applicable electrical code, NFPA 70 and local energy code.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of high efficiency motors.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc. or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.07 WARRANTY

A. Provide five year manufacturer warranty for motors larger than 1/2 horsepower.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Baldor Electric Company/ABB Group: www.baldor.com.

B. Lincoln Motors: www.lincolnmotors.com/#sle.

C. A. O. Smith Electrical Products Company: www.aosmithmotors.com/#sle.

D. Reliance Electric/Rockwell Automation: www.reliance.com.

2.02 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Electrical Service: Refer to Section 26 27 17 for required electrical characteristics.

B. Electrical Service, General. See drawings for specific details:
   1. Motors 1/2 HP and Smaller: 115 volts, single phase, 60 Hz
   2. Motors Larger than 1/2 Horsepower: 460 volts, three phase, 60 Hz.

C. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 40 degrees C environment.
   3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
   4. All motors shall be premium efficiency type.
   5. All motors which require variable speed operation shall be inverter duty or ECM type.

D. Explosion-Proof Motors: UL approved and labelled for hazard classification, with over temperature protection.

E. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor.

F. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide conduit connection in end frame.

2.03 APPLICATIONS

A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not conform to these specifications.

B. Single phase motors for shaft mounted fans and centrifugal pumps: Split phase type.

C. Single phase motors for shaft mounted fans or blowers: Permanent split capacitor type or electronically commutated (ECM) type. See schedules for requirements.

D. Single phase motors for fans, pumps, and blowers: Capacitor start type.

E. Single phase motors for fans, blowers, and pumps: Capacitor start, capacitor run type.

F. Motors located in outdoors and in draw through cooling towers: Totally enclosed weatherproof epoxy-treated type.

2.04 SINGLE PHASE POWER - SPLIT PHASE MOTORS

A. Starting Torque: Less than 150 percent of full load torque.

B. Starting Current: Up to seven times full load current.

C. Breakdown Torque: Approximately 200 percent of full load torque.

D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.

E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.05 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

A. Starting Torque: Exceeding one fourth of full load torque.

B. Starting Current: Up to six times full load current.

C. Multiple Speed: Through tapped windings.

D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.06 SINGLE PHASE POWER - CAPACITOR START MOTORS

A. Starting Torque: Three times full load torque.

B. Starting Current: Less than five times full load current.

C. Pull-up Torque: Up to 350 percent of full load torque.

D. Breakdown Torque: Approximately 250 percent of full load torque.

E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.

F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve bearings.

G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.07 THREE PHASE POWER - SQUIRREL CAGE MOTORS

A. Starting Torque: Between 1 and 1-1/2 times full load torque.

B. Starting Current: Six times full load current.

C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.

D. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B motors.

E. Insulation System: NEMA Class B or better.

F. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.

G. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

H. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors embedded in motor windings and epoxy encapsulated solid state control relay for wiring into motor starter; refer to Section 26 29 13.

I. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

J. Sound Power Levels: To NEMA MG 1.

K. Part Winding Start Above 254T Frame Size: Use part of winding to reduce locked rotor starting current to approximately 60 percent of full winding locked rotor current while providing approximately 50 percent of full winding locked rotor torque.

L. Weatherproof Epoxy Sealed Motors: Epoxy seal windings using vacuum and pressure with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.

M. Nominal Efficiency: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.

N. Nominal Power Factor: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

D. Provide detailed installation and purchase information for reimbursement by Utility for rebate program.

3.02 SCHEDULE - PREMIUM EFFICIENCY

A. NEMA Open Motor Service Factors.
   1. 1/6-1/3 hp:
      a. 3600 rpm: 1.35.
      b. 1800 rpm: 1.35.
      c. 1200 rpm: 1.35.
      d. 900 rpm: 1.35.
   2. 1/2 hp:
      a. 3600 rpm: 1.25.
      b. 1800 rpm: 1.25.
      c. 1200 rpm: 1.25.
      d. 900 rpm: 1.15.
   3. 3/4 hp:
      a. 3600 rpm: 1.25.
      b. 1800 rpm: 1.25.
      c. 1200 rpm: 1.15.
      d. 900 rpm: 1.15.
   4. 1 hp:
      a. 3600 rpm: 1.25.
      b. 1800 rpm: 1.15.
      c. 1200 rpm: 1.15.
      d. 900 rpm: 1.15.
   5. 1.5-150 hp:
      a. 3600 rpm: 1.15.
      b. 1800 rpm: 1.15.
      c. 1200 rpm: 1.15.
      d. 900 rpm: 1.15.

B. Three Phase - Premium Efficiency, Open Drip-Proof Performance:
   1. Ratings.
      a. 1 hp:
         1) NEMA Frame: 145T.
         2) Minimum Percent Power Factor: 72.
         3) Minimum Percent Efficiency: 82.5% @ 1200 RPM, 85.5%@ 1800 RPM, 77% @ 3600 RPM
      b. 1-1/2 hp:
         1) NEMA Frame: 182T.
         2) Minimum Percent Power Factor: 73.
         3) Minimum Percent Efficiency: 86.5% @ 1200 RPM, 86.5% @ 1800 RPM, 84% @ 3600 RPM

c. 2 hp:
   1) NEMA Frame: 184T.
   2) Minimum Percent Power Factor: 75.
   3) Minimum Percent Efficiency: 87.5% @ 1200 RPM, 86.5% @ 1800 RPM, 85.5% @ 3600 RPM
d. 3 hp:
   1) NEMA Frame: 213T.
   2) Minimum Percent Power Factor: 60.
   3) Minimum Percent Efficiency: 88.5% @ 1200 RPM, 89.5% @ 1800 RPM, 85.5% @ 3600 RPM
e. 5 hp:
   1) NEMA Frame: 215T.
   2) Minimum Percent Power Factor: 65.
   3) Minimum Percent Efficiency: 89.5% @ 1200 RPM, 89.5% @ 1800 RPM, 86.5% @ 3600 RPM
f. 7-1/2 hp:
   1) NEMA Frame: 254T.
   2) Minimum Percent Power Factor: 73.
   3) Minimum Percent Efficiency: 90.2% @ 1200 RPM, 91% @ 1800 RPM, 88.5% @ 3600 RPM
g. 10 hp:
   1) NEMA Frame: 256T.
   2) Minimum Percent Power Factor: 74.
   3) Minimum Percent Efficiency: 91.7% @ 1200 RPM, 91.7% @ 1800 RPM, 89.5% @ 3600 RPM
h. 15 hp:
   1) NEMA Frame: 284T.
   2) Minimum Percent Power Factor: 77.
   3) Minimum Percent Efficiency: 91.7% @ 1200 RPM, 93% @ 1800 RPM, 90.2% @ 3600 RPM.
i. 20 hp:
   1) NEMA Frame: 286T.
   2) Minimum Percent Power Factor: 78.
   3) Minimum Percent Efficiency: 92.4% @ 1200 RPM, 93% @ 1800 RPM, 91% @ 3600 RPM
j. 25 hp:
   1) NEMA Frame: 324T.
   2) Minimum Percent Power Factor: 74.
   3) Minimum Percent Efficiency: 93% @ 1200 RPM, 93.6% @ 1800 RPM, 91.7% @ 3600 RPM
k. 30 hp:
   1) NEMA Frame: 326T.
   2) Minimum Percent Power Factor: 78.
   3) Minimum Percent Efficiency: 93.6% @ 1200 RPM, 94.1% @ 1800 RPM, 91.7% @ 3600 RPM
l. 40 hp:
   1) NEMA Frame: 364T.
   2) Minimum Percent Power Factor: 77.
   3) Minimum Percent Efficiency: 94.1% @ 1200 RPM, 94.1 @ 1800 RPM, 92.4% @ 3600 RPM
m. 50 hp:
   1) NEMA Frame: 365T.
   2) Minimum Percent Power Factor: 79.

3) Minimum Percent Efficiency: 94.1% @ 1200 RPM, 94.5% @ 1800 RPM, 93% @ 3600 RPM

n. 60 hp:
1) NEMA Frame: 404T.
2) Minimum Percent Power Factor: 82.
3) Minimum Percent Efficiency: 93.

o. 75 hp:
1) NEMA Frame: 405T.
2) Minimum Percent Power Factor: 80.
3) Minimum Percent Efficiency: 93.

p. 100 hp:
1) NEMA Frame: 444T.
2) Minimum Percent Power Factor: 80.
3) Minimum Percent Efficiency: 93.

C. Three Phase - Premium Efficiency, Totally Enclosed, Fan Cooled Performance:
1. 1200 rpm.
a. 1 hp:
1) NEMA Frame: 145T.
2) Minimum Percent Power Factor: 72.
3) Minimum Percent Efficiency: 82.5% @ 1200 RPM, 85.5% 2 1800 RPM, 77% @ 3600 RPM

b. 1-1/2 hp:
1) NEMA Frame: 182T.
2) Minimum Percent Power Factor: 73.
3) Minimum Percent Efficiency: 87.5% @ 1200 RPM, 86.5% @ 1800 RPM, 84% @ 3600 RPM

c. 2 hp:
1) NEMA Frame: 184T.
2) Minimum Percent Power Factor: 68.
3) Minimum Percent Efficiency: 88.5% @ 1200 RPM, 86.5% @ 1800 RPM, 85.5% @ 3600 RPM

d. 3 hp:
1) NEMA Frame: 213T.
2) Minimum Percent Power Factor: 63.
3) Minimum Percent Efficiency: 89.5% @ 1200 RPM, 89.5% @ 1800 RPM, 86.5% @ 3600 RPM

e. 5 hp:
1) NEMA Frame: 215T.
2) Minimum Percent Power Factor: 66.
3) Minimum Percent Efficiency: 89.5% @ 1200 RPM, 89.5% @ 1800 RPM, 88.5% @ 3600 RPM

f. 7-1/2 hp:
1) NEMA Frame: 254T.
2) Minimum Percent Power Factor: 68.
3) Minimum Percent Efficiency: 91% @ 1200 RPM, 91.7% @ 1800 RPM, 89.5% @ 3600 RPM

g. 10 hp:
1) NEMA Frame: 256T.
2) Minimum Percent Power Factor: 75.
3) Minimum Percent Efficiency: 91% @ 1200 RPM, 91.7% @ 1800 RPM, 90.2% @ 3600 RPM

h. 15 hp:
1) NEMA Frame: 284T.

2) Minimum Percent Power Factor: 72.
3) Minimum Percent Efficiency: 91.7% @ 1200 RPM, 92.4% @ 1800 RPM, 91% @ 3600 RPM

i. 20 hp:
1) NEMA Frame: 286T.
2) Minimum Percent Power Factor: 76.
3) Minimum Percent Efficiency: 91.7% @ 1200 RPM, 93% @ 1800 RPM, 91% @ 3600 RPM

j. 25 hp:
1) NEMA Frame: 324T.
2) Minimum Percent Power Factor: 71.
3) Minimum Percent Efficiency: 93% @ 1200 RPM, 93.6% @ 1800 RPM, 91.7% @ 3600 RPM

k. 30 hp:
1) NEMA Frame: 326T.
2) Minimum Percent Power Factor: 79.
3) Minimum Percent Efficiency: 93% @ 1200 RPM, 93.6% @ 1800 RPM, 91.7% @ 3600 RPM.

l. 40 hp:
1) NEMA Frame: 364T.
2) Minimum Percent Power Factor: 78.
3) Minimum Percent Efficiency: 94.1% @ 1200 RPM, 94.1% @ 1800 RPM, 92.4% @ 3600 RPM

m. 50 hp:
1) NEMA Frame: 365T.
2) Minimum Percent Power Factor: 81.
3) Minimum Percent Efficiency: 94.1% @ 1200 RPM, 94.5% @ 1800 RPM, 93% @ 3600 RPM

n. Over 50 HP - Refer to National Grid "Motor Up" Energy Efficiency requirements for reimbursement.

END OF SECTION

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SECTION 23 05 16
EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flexible pipe connectors.

B. Expansion joints and compensators.

C. Pipe loops, offsets, and swing joints.

1.02 RELATED REQUIREMENTS

A. Section 23 21 13 - Hydronic Piping.

B. Section 23 23 00 - Refrigerant Piping.

1.03 REFERENCE STANDARDS

A. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a (Reapproved 2019).

B. EJMA (STDS) - EJMA Standards; Tenth Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data:
   1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
   2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

C. Design Data: Indicate selection calculations.

D. Manufacturer's Instructions: Indicate manufacturer's installation instructions, special procedures, and external controls.

E. Project Record Documents: Record installed locations of flexible pipe connectors, expansion joints, anchors, and guides.

F. Maintenance Data: Include adjustment instructions.

1.05 REGULATORY REQUIREMENTS

A. Conform to UL requirements.

1.06 EXTRA MATERIALS

A. Supply two sets of packing for each packed expansion joint.

PART 2 PRODUCTS

2.01 FLEXIBLE PIPE CONNECTORS - STEEL PIPING

A. Manufacturers:
   1. Mercer Rubber Company: www.mercer-rubber.com/#sle.
   2. Metraflex Company: www.metraflex.com.

B. Inner Hose: Carbon Steel.

C. Exterior Sleeve: Single braided, stainless steel or bronze.

D. Pressure Rating: 125 psi and 450 degrees F.

E. Joint: As specified for pipe joints.

F. Size: Use pipe sized units.

G. Maximum offset: 3/4 inch on each side of installed center line.

2.02 FLEXIBLE PIPE CONNECTORS - COPPER PIPING

A. Manufacturer:
   1. Mercer Rubber Company: www.mercer-rubber.com/#sle.
   2. Metraflex Company: www.metraflex.com/#sle.

B. Inner Hose: Bronze.

C. Exterior Sleeve: Braided bronze.

D. Pressure Rating: 125 psi and 450 degrees F.

E. Joint: As specified for pipe joints.

F. Size: Use pipe sized units.

G. Maximum offset: 3/4 inch on each side of installed center line.

H. Application: Copper piping.

2.03 EXPANSION JOINTS - TWO-PLY BRONZE BELLOWS TYPE

A. Manufacturers:
   1. Mercer Rubber Company: www.mercer-rubber.com/#sle.
   2. Metraflex Company: www.metraflex.com/#sle.

B. Construction: Bronze with anti-torque device, limit stops, internal guides.

C. Pressure Rating: 125 psi and 400 degrees F.

D. Maximum Compression: 1-3/4 inches.

E. Maximum Extension: 1/4 inch.

F. Joint: As specified for pipe joints.

G. Size: Use pipe sized units.

H. Application: Copper piping.

2.04 EXPANSION JOINTS - COPPER WITH PACKED SLIDING SLEEVE

A. Working Pressure: 125 psi.

B. Maximum Temperature: 250 degrees F.

C. Joint: As specified for pipe joints.

D. Size: Use pipe sized units.

E. Application: Copper or steel piping 2 inches and over.

2.05 ACCESSORIES

A. Stainless Steel Pipe: ASTM A269.

B. Pipe Alignment Guides:
   1. Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inches travel.

C. Swivel Joints:
   1. Fabricated steel body, double ball bearing race, field lubricated, with rubber (Buna-N) o-ring seals.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.

C. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.

D. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.

E. Anchor pipe to building structure where indicated. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.

F. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

G. Substitute grooved piping for vibration isolated equipment instead of flexible connectors. Grooved piping need not be anchored.

END OF SECTION

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SECTION 23 05 48
VIBRATION AND SEISMIC CON. FOR EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolators.

B. Seismic restraints for suspended components and equipment.

C. Roof curbs.

D. Seismic restraints.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

B. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.

C. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

D. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.

E. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide schedule of vibration isolator type with location and load on each.

C. Shop Drawings: Indicate inertia bases and locate vibration isolators, with static and dynamic load on each. Indicate seismic control measures.

D. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Isolation Technology, Inc: www.isolationtech.com.

B. Kinetics Noise Control, Inc: www.kineticsnoise.com/#sle.

C. Mason Industries: www.mason-ind.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

A. General:
   1. All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.
   2. Steel springs to function without undue stress or overloading.

2.03 VIBRATION ISOLATORS

A. Non-Seismic Type:
   1. All Elastomeric-Fiber Glass Pads:
      a. Configuration: Flat or molded.
      b. Thickness: 0.25 inch minimum.
      c. Assembly: Single or multiple layers using bonded, galvanized sheet metal separation plate between each layer with load plate providing evenly distributed load over pad surface.
   2. Elastomeric Mounts:
      a. Material: Oil, ozone, and oxidant resistant compounds.

b. Assembly: Encapsulated load transfer plate bolted to equipment and base plate with anchor hole bolted to supporting structure.

3. Steel Springs:
   a. Assembly: Freestanding, laterally stable without housing.
   b. Leveling Device: Rigidly connected to equipment or frame.
4. Restrained Steel Springs:
   a. Housing: Rigid blocking during rigging prevents equipment installed and operating height from changing during temporary weight reduction.
   b. Equipment Wind Loading: Adequate means for fastening isolator top to equipment and isolator base plate to supporting structure.
5. Elastomeric Hangers:
   a. Housing: Steel construction containing elastomeric isolation element to prevent rod contact with housing and short-circuiting of isolating function.
   b. Incorporate steel load distribution plate sandwiching elastomeric element to housing.
6. Spring Hanger:
   a. Housing: Steel construction containing stable steel spring and integral elastomeric element preventing metal to metal contact.
   b. Bottom Opening: Sized to allow plus/minus 15 degrees rod misalignment.
7. Combination Elastomeric-Spring Hanger:
   a. Housing: Steel construction containing stable steel spring with elastomeric element in series isolating upper connection of hanger box to building structure.
   b. Bottom Opening: Sized to allow plus/minus 15 degrees rod misalignment.
8. Thrust Restraints:
   a. Housing: Steel construction containing stable steel spring and integral elastomeric element installed in pairs to resist air pressure thrusts.
   b. Bottom Openings: Sized to allow plus/minus 15 degrees rod misalignment.

B. Seismic Type:
1. Coil Springs Consisting of Single Elements:
   a. Housing: Manufactured from cast iron material.
   b. Ductile Material: Designed and rated for seismic applications.
   c. Spring: Restrained by housing without significant degradation of vibration isolation capabilities during normal equipment operating conditions.
   d. Resilient Snubbing Grommet System: Incorporated and designed with clearances of no more than 0.25 inch in any direction preventing direct metal-to-metal contact between supported member and fixed restraint housing.
   e. Resilient Pad: Located in series with spring.
   f. Coil Springs: Color coded elements to have a lateral stiffness greater than 0.8 times the rated vertical stiffness with 50 percent overload capacity.
   g. Finish: Suitable for the application.
2. All Directional Elastomeric:
   a. Material: Molded from oil, ozone, and oxidant resistant compounds.
   b. Operating Parameters: Designed to operate within the isolator strain limits providing maximum performance and service life.
   c. Attachment Method: Encapsulated load transfer plate bolted to equipment and base plate with anchor hole bolted to supporting structure.
   d. Rating: Cast iron and aluminum housings rated for seismic restraint applications.
   e. Minimum Operating Static Deflections: Deflections indicated in project documents are not to exceed published load capacities.

2.04 SEISMIC RESTRAINTS FOR SUSPENDED COMPONENTS AND EQUIPMENT

A. Comply with:
1. ASHRAE (HVACA) Handbook - HVAC Applications.
2. FEMA 412.
3. FEMA 413.

4. FEMA 414.
5. FEMA E-74.
6. SMACNA (SRM).

B. Cable Restraints:
1. Wire Rope: Steel wire strand cables sized to resist seismic loads in all lateral directions.
2. Protective Thimbles: Eliminates potential for dynamic cable wear and strand breakage.
3. Size: Based on the lesser of cable capacity or anchor load taking into account bracket geometry.
4. Connections:
a. Use overlapping wire rope U clips, cable clamping bolts, swaged sleeves or seismically rated tool-less wedge insert lock connectors.
b. Internally brace clevis hanger bracket cross bolt to prevent deformation.
5. Vertical Suspension Rods: Attach required bracing of sufficient strength to prevent rod buckling from vertical compression forces utilizing series of attachment clips.

C. Rigid Restraints:
1. Structural Element: Sized to resist seismic loads in all lateral directions and carry both compressive and tensile loading.
2. Size: Based on the lesser of cable capacity or anchor load taking into account bracket geometry.
3. Connections: Internally brace clevis hanger bracket cross bolt to prevent deformation.
4. Static Support System: Anchorage capable of carrying additional tension loads generated by the vertical component of the rigid brace compression which is additive to any static load requirements on the system.
5. Vertical Suspension Rods: Attached required bracing of sufficient strength to prevent rod buckling from vertical compression forces utilizing series of attachment clips.

2.05 ROOF CURBS

A. Vibration Isolation Curbs:
1. Non-Seismic Curb Rail:
a. Location: Between existing roof curb and rooftop equipment.
b. Construction: Aluminum.
c. Integral vibration isolation to conform to requirements of this section.
d. Weather exposed components consist of corrosion resistant materials.
2. Non-Seismic Curb:
a. Location: Between structure and rooftop equipment.
b. Construction: Aluminum.
c. Integral vibration isolation to conform to requirements of this section.
d. Weather exposed components consist of corrosion resistant materials.
3. Seismic Curb:
a. Location: Between structure and rooftop equipment.
b. Construction: Steel.
c. Integral vibration isolation to conform to requirements of this section.
d. Snubbers consist of minimum 0.25 inch thick resilient pads to avoid metal-to-metal contact without compromising vibration isolating capabilities.
e. Weather exposed components consist of corrosion resistant materials.

B. Seismic Type Non-Isolated Curb and Fabricated Equipment Piers:
1. Location: Between structure and rooftop equipment.
2. Construction: Steel.
3. Weather exposed components consist of corrosion resistant materials.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Install in accordance with manufacturer's instructions.

B. Bases:

1. Set steel bases for one inch clearance between housekeeping pad and base.
2. Set concrete inertia bases for 2 inches clearance between housekeeping pad and base.
3. Adjust equipment level.

C. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.

D. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.

E. Provide pairs of horizontal limit springs on fans with more than 6.0 inches WC static pressure, and on hanger supported, horizontally mounted axial fans.

F. Provide seismic snubbers for all equipment, piping, and ductwork mounted on isolators. Each inertia base shall have minimum of four seismic snubbers located close to isolators. Snub equipment designated for post-disaster use to 0.05 inch maximum clearance. Other snubbers shall have clearance between 0.15 inch and 0.25 inch.

G. Support piping connections to equipment mounted on isolators using isolators or resilient hangers as follows:
1. Up to 4 Inches Pipe Size: First three points of support.
2. 5 to 8 Inches Pipe Size: First four points of support.
3. 10 inches Pipe Size and Over: First six points of support.
4. Select three hangers closest to vibration source for minimum 1.0 inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0 inch static deflection or 1/2 static deflection of isolated equipment.

3.02 FIELD QUALITY CONTROL

A. Inspect isolated equipment after installation and submit report. Include static deflections.

3.03 SCHEDULE

A. Pipe Isolation Schedule.
1. 1 Inch Pipe Size: Isolate 120 diameters from equipment.
2. 2 Inch Pipe Size: Isolate 90 diameters from equipment.
3. 3 Inch Pipe Size: Isolate 80 diameters from equipment.
4. 4 Inch Pipe Size: Isolate 75 diameters from equipment.
5. 6 Inch Pipe Size: Isolate 60 diameters from equipment.
6. 8 Inch Pipe Size: Isolate 60 diameters from equipment.
7. 10 Inch Pipe Size: Isolate 54 diameters from equipment.
8. 12 Inch Pipe Size: Isolate 50 diameters from equipment.
9. 16 Inch Pipe Size: Isolate 45 diameters from equipment.
10. 24 Inch Pipe Size: Isolate 38 diameters from equipment.
11. Over 24 Inch Pipe Size: As indicated.

END OF SECTION

SECTION 23 05 53
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.
B. Tags.
C. Stencils.
D. Pipe Markers.
E. Ceiling tacks.

1.02 RELATED REQUIREMENTS

A. Section 09 90 00 - Painting and Coating: Identification painting.

1.03 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
D. Product Data: Provide manufacturers catalog literature for each product required.
E. Samples: Submit two labels or tags 1/2 x 4 inch in size.
F. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
G. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.
B. Air Terminal Units: Tags.
C. Automatic Controls: Tags. Key to control schematic.
D. Control Panels: Nameplates.
E. Dampers: Ceiling tacks, where located above lay-in ceiling.
F. Heat Transfer Equipment: Nameplates.
G. Instrumentation: Tags.
H. Major Control Components: Nameplates.
I. Piping: Tags.
J. Pumps: Nameplates.
K. Relays: Tags.
L. Small-sized Equipment: Tags.
M. Tanks: Nameplates.
N. Thermostats: Nameplates.
O. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.02 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.
B. Champion America, Inc: www.Champion-America.com.

C. Seton Identification Products: www.seton.com/aec.

2.03 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/2 inch.
   3. Background Color: Black.

2.04 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

B. Metal Tags: Aluminum with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.05 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
   1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
   2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
   3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
   4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
   5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
   6. Ductwork and Equipment: 2-1/2 inch high letters.

B. Stencil Paint: As specified in Section 09 90 00, semi-gloss enamel, colors conforming to ASME A13.1.

2.06 PIPE MARKERS

A. Color: Conform to ASME A13.1.

B. For refrigerant piping, provide pipe markers to identify the following:
   1. Refrigerant state (high pressure gas, low pressure gas, or liquid)
   2. Connected equipment, HP or FC.
   3. Connected room number(s), where applicable.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

F. Color code as follows:
   1. Coordinate with owner.

2.07 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:
   1. Coordinate with owner.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Refrigerant piping shall be labeled with the refrigerant state (high pressure gas, low pressure gas, or liquid) as well as the connected fan coil and associated room served.

D. Apply stencil painting in accordance with Section 09 90 00.

E. Install plastic pipe markers in accordance with manufacturer's instructions.

F. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

G. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

H. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

I. Identify control panels and major control components outside panels with plastic nameplates.

J. Identify thermostats relating to terminal boxes or valves with nameplates.

K. Identify valves in main and branch piping with tags.

L. Identify air terminal units and radiator valves with numbered tags.

M. Tag automatic controls, instruments, and relays. Key to control schematic.

N. Identify piping, concealed or exposed, with plastic pipe markers, plastic tape pipe markers or stencilled painting. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

O. Identify ductwork with plastic nameplates or stencilled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

P. Locate ceiling tacks to locate valves, units, or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

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SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of refrigerating systems.

C. Testing, adjustment, and balancing of domestic potable hot water system loop.

D. Measurement of final operating condition of HVAC systems.

E. Sound measurement of equipment operating conditions.

F. Vibration measurement of equipment operating conditions.

G. Commissioning activities.

1.02 RELATED REQUIREMENTS

A. Section 01 91 10 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.

B. Section 01 91 10 - Functional Testing Procedures

C. Section 23 08 00 - Mechanical Systems Commissioning

D. Section 23 08 10 - Control Systems Commissioning

1.03 REFERENCE STANDARDS

A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008 (Reaffirmed 2017).

C. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, with Errata (2017).

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit to Architect.
   2. Submit to the Commissioning Authority, Construction Manager, and HVAC controls contractor.
   3. Submit six weeks prior to starting the testing, adjusting, and balancing work.
   4. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.
   5. Include at least the following in the plan:
      a. Preface: An explanation of the intended use of the control system.
      b. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      c. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      d. Identification and types of measurement instruments to be used and their most recent calibration date.

e. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
f. Final test report forms to be used.
g. Detailed step-by-step procedures for TAB work for each system and issue, including:
    1) Terminal flow calibration (for each terminal type).
    2) Diffuser proportioning.
    3) Branch/submain proportioning.
    4) Total flow calculations.
    5) Rechecking.
    6) Diversity issues.
h. Expected problems and solutions, etc.
i. Criteria for using air flow straighteners or relocating flow stations and sensors .
j. Details of how TOTAL flow will be determined; for example:
    1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
    2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.
k. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.
l. Confirmation of understanding of the outside air ventilation criteria under all conditions.
m. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
n. Method of checking building static and exhaust fan and/or relief damper capacity.
o. Proposed selection points for sound measurements and sound measurement methods.
p. Methods for making coil or other system plant capacity measurements, if specified.
q. Time schedule for TAB work to be done in phases (by floor, etc.).
r. Description of TAB work for areas to be built out later, if any.
s. Time schedule for deferred or seasonal TAB work, if specified.
t. False loading of systems to complete TAB work, if specified.
u. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
v. Interstitial cavity differential pressure measurements and calculations, if specified.
w. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
x. Procedures for formal progress reports, including scope and frequency.
y. Procedures for formal deficiency reports, including scope, frequency and distribution.

D. Field Logs: Submit at least once a week to Commissioning Authority and Construction Manager.

E. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

F. Progress Reports.

G. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
1. Submit to the Commissioning Authority, Construction Manager, and HVAC controls contractor within two weeks after completion of testing, adjusting, and balancing.
2. Revise TAB plan to reflect actual procedures and submit as part of final report.
3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.

4. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
7. Units of Measure: Report data in I-P (inch-pound) units only.
8. Include the following on the title page of each report:
    a. Name of Testing, Adjusting, and Balancing Agency.
    b. Address of Testing, Adjusting, and Balancing Agency.
    c. Telephone number of Testing, Adjusting, and Balancing Agency.
    d. Project name.
    e. Project location.
    f. Project Architect.
    g. Project Engineer.
    h. Project Contractor.
    i. Project altitude.
    j. Report date.

H. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

1.05 QUALITY ASSURANCE (MOVED TO PART 3)

1.06 PRE-BALANCING MEETING (MOVED TO PART 3)

1.07 SEQUENCING AND SCHEDULING (MOVED TO PART 3)

1.08 WARRANTY (MOVED TO PART 3)

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
1. AABC MN-1, AABC National Standards for Total System Balance.
2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
4. SMACNA HVAC Systems Testing, Adjusting, and Balancing.
5. Maintain at least one copy of the standard to be used at project site at all times.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
2. Having minimum of three years documented experience.
3. Certified by one of the following:
    a. AABC, Associated Air Balance Council: www.aabchq.com; upon completion submit AABC National Performance Guaranty.
    b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
    c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

E. TAB Supervisor Qualifications: Certified by same organization as TAB agency.

F. TAB Supervisor Qualifications: Professional Engineer licensed in the State in which the Project is located.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage is minimized.
   12. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
   1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

C. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 10 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 10 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

H. Check and adjust systems approximately six months after final acceptance and submit report.

3.06 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities .

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive and sheave changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

M. Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.

N. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

O. On fan powered VAV boxes, adjust air flow switches for proper operation.

P. For laboratories, lab classrooms, and prep rooms, offset CFM values (differential between exhaust/return and supply airflows) shall be required to maintain a plus 10% minus 5% offset.

3.07 DOMESTIC HOT WATER RECIRCULATION SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements and balance valves prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

E. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.08 COMMISSIONING

A. Perform prerequisites prior to starting commissioning activities.

B. Fill out Prefunctional Checklists for:
   1. Air side systems.
   2. Refrigeration systems
   3. Packaged rooftop units.
   4. Kitchen ventilation systems.
   5. VRF systems.
   6. Energy recovery ventilators.
   7. Exhaust fans.

C. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.

D. Re-check minimum outdoor air intake flows and maximum and intermediate total airflow rates for 100 percent of the air handlers plus a random sample equivalent to 10 percent of the final TAB report data as directed by Commissioning Authority.
   1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.
   2. Use the same test instruments as used in the original TAB work.
   3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
   4. For purposes of re-check, failure is defined as follows:
      a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
      b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control, deviation of more than 30 percent at intermediate supply flow.
      c. Temperatures: Deviation of more than one degree F.
      d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.
      e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.
   5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.

E. In the presence of the Commissioning Authority, verify that:
   1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
   2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.

3.09 SCOPE

A. Test, adjust, and balance the following:

1. Plumbing Pumps
2. Air Cooled Refrigerant Condensers
3. Fan Coils, Including VRF Fan Coils
4. Packaged Roof Top Heating/Cooling Units.
5. Terminal Heat Transfer Units
6. Air Handling Units/Rooftop Mounted Air handling units/Energy Recovery Ventilators
7. Fans / Exhaust Fans
8. Air Filters
9. Air Inlets and Outlets

3.10 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
1. Manufacturer
2. Model/Frame
3. HP/BHP
4. Phase, voltage, amperage; nameplate, actual, no load
5. RPM
6. Service factor
7. Starter size, rating, heater elements
8. Sheave Make/Size/Bore

B. V-Belt Drives:
1. Identification/location
2. Required driven RPM
3. Driven sheave, diameter and RPM
4. Belt, size and quantity
5. Motor sheave diameter and RPM
6. Center to center distance, maximum, minimum, and actual

C. Pumps:
1. Identification/number
2. Manufacturer
3. Size/model
4. Impeller
5. Service
6. Design flow rate, pressure drop, BHP
7. Actual flow rate, pressure drop, BHP
8. Discharge pressure
9. Suction pressure
10. Total operating head pressure
11. Shut off, discharge and suction pressures
12. Shut off, total head pressure

D. Air Cooled Condensers:
1. Identification/number
2. Location
3. Manufacturer
4. Model number
5. Serial number
6. Entering DB air temperature, design and actual
7. Leaving DB air temperature, design and actual
8. Number of compressors

E. Cooling Coils:
1. Identification/number
2. Location
3. Service

4. Manufacturer
5. Air flow, design and actual
6. Entering air DB temperature, design and actual
7. Entering air WB temperature, design and actual
8. Leaving air DB temperature, design and actual
9. Leaving air WB temperature, design and actual
10. Water flow, design and actual
11. Water pressure drop, design and actual
12. Entering water temperature, design and actual
13. Leaving water temperature, design and actual
14. Saturated suction temperature, design and actual
15. Air pressure drop, design and actual

F. Heating Coils:
1. Identification/number
2. Location
3. Service
4. Manufacturer
5. Air flow, design and actual
6. Gas flow rate
7. Entering air temperature, design and actual
8. Leaving air temperature, design and actual
9. Air pressure drop, design and actual

G. Electric Duct Heaters:
1. Manufacturer
2. Identification/number
3. Location
4. Model number
5. Design kW
6. Number of stages
7. Phase, voltage, amperage
8. Test voltage (each phase)
9. Test amperage (each phase)
10. Air flow, specified and actual
11. Temperature rise, specified and actual

H. Air Moving Equipment:
1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Arrangement/Class/Discharge
6. Air flow, specified and actual
7. Return air flow, specified and actual
8. Outside air flow, specified and actual
9. Total static pressure (total external), specified and actual
10. Inlet pressure
11. Discharge pressure
12. Sheave Make/Size/Bore
13. Number of Belts/Make/Size
14. Fan RPM

I. Return Air/Outside Air:
1. Identification/location
2. Design air flow

3. Actual air flow
4. Design return air flow
5. Actual return air flow
6. Design outside air flow
7. Actual outside air flow
8. Return air temperature
9. Outside air temperature
10. Required mixed air temperature
11. Actual mixed air temperature
12. Design outside/return air ratio
13. Actual outside/return air ratio

J. Exhaust Fans:
1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Air flow, specified and actual
6. Total static pressure (total external), specified and actual
7. Inlet pressure
8. Discharge pressure
9. Sheave Make/Size/Bore
10. Number of Belts/Make/Size
11. Fan RPM
12. Associated with Fume Hoods, Include:
    a. Face velocity test at max/min sash position.

K. Duct Traverses:
1. System zone/branch
2. Duct size
3. Area
4. Design velocity
5. Design air flow
6. Test velocity
7. Test air flow
8. Duct static pressure
9. Air temperature
10. Air correction factor

L. Duct Leak Tests:
1. Description of ductwork under test
2. Duct design operating pressure
3. Duct design test static pressure
4. Duct capacity, air flow
5. Maximum allowable leakage duct capacity times leak factor
6. Test apparatus
    a. Blower
    b. Orifice, tube size
    c. Orifice size
    d. Calibrated
7. Test static pressure
8. Test orifice differential pressure
9. Leakage

M. Flow Measuring Stations:
1. Identification/number
2. Location

3. Size
4. Manufacturer
5. Model number
6. Serial number
7. Design Flow rate
8. Design pressure drop
9. Actual/final pressure drop
10. Actual/final flow rate
11. Station calibrated setting

N. Air Distribution Tests / Air Inlets and Outlets:
1. Air terminal number
2. Room number/location
3. Terminal type
4. Terminal size
5. Design velocity
6. Design air flow
7. Test (final) velocity
8. Test (final) air flow
9. Percent of design air flow

O. Sound Level Reports:
1. Location
2. Octave bands - equipment off
3. Octave bands - equipment on

P. Vibration Tests:
1. Location of points:
   a. Fan bearing, drive end
   b. Fan bearing, opposite end
   c. Motor bearing, center (if applicable)
   d. Motor bearing, drive end
   e. Motor bearing, opposite end
   f. Casing (bottom or top)
   g. Casing (side)
   h. Duct after flexible connection (discharge)
   i. Duct after flexible connection (suction)
2. Test readings:
   a. Horizontal, velocity and displacement
   b. Vertical, velocity and displacement
   c. Axial, velocity and displacement
3. Normally acceptable readings, velocity and acceleration
4. Unusual conditions at time of test
5. Vibration source (if non-complying)

END OF SECTION

SECTION 23 07 13
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct Lagging.

C. Insulation jackets.

1.02 RELATED REQUIREMENTS

A. Section 09 90 00 - Painting and Coating: Painting insulation jackets.

B. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

C. Section 23 05 53 - Identification for HVAC Piping and Equipment.

D. Section 23 31 00 - HVAC Ducts and Casings: Glass fiber ducts.

1.03 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

F. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.

G. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

I. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

J. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

K. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

L. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

M. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experienceand approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.07 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:
   1. Knauf Insulation: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com/#sle.
   3. Owens Corning Corp: www.owenscorning.com/#sle.
   4. CertainTeed Corporation: www.certainteed.com/#sle.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. Minimum "R" Value: Minimum R value of (8) is required for interior installations and a minimum R value of (12) is required for exterior installations.
   2. Maximum Service Temperature: 450 degrees F.
   3. Maximum Water Vapor Sorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:
   1. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   2. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

E. Outdoor Vapor Barrier Mastic:
   1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

F. Tie Wire: Annealed steel, 16 gage.

2.03 GLASS FIBER, RIGID

A. Manufacturer:
   1. Knauf Insulation: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com/#sle.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation: www.certainteed.com/#sle.

B. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. Minimum "R" Value: Minimum R value of (8) is required for interior installations and a minimum R value of (12) is required for exterior installations.
   2. Maximum service temperature: 450 degrees F.
   3. Maximum Water Vapor Sorption: 5.0 percent.

C. Vapor Barrier Jacket:

1. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
2. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

E. Indoor Vapor Barrier Finish:
1. Cloth: Untreated; 9 oz/sq yd weight, glass fabric.
2. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.04 JACKETS

A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
1. Lagging Adhesive:
a. Compatible with insulation.

B. Aluminum Jacket: ASTM B209 (ASTM B209M).
1. Thickness: 0.016 inch sheet.
2. Finish: Embossed.
3. Joining: Longitudinal slip joints and 2 inch laps.
4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
6. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

2.05 DUCT LAGGING

A. Manufacturers:
1. Sound Seal: www.soundseal.com
2. Kinetics Noise Control: www.kineticsnoise.com.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Lagging: Loaded vinyl noise barrier with a scrim reinforced aluminum foil facing on one side with a 1" thick fiberglass decoupler.
1. Apparent Thermal Conductivity: Maximum of.25 at 75 degrees F
2. Service Temperature: Up to 350 degrees F.

C. Adhesive: Waterproof, fire-retardant type, ASTM C916.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ducts conveying air below ambient temperature:
1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated ducts conveying air above ambient temperature:
1. Provide with or without standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with aluminum jacket and paint per architect's specifications unless noted otherwise.

F. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with with calked aluminum jacket with seams located on bottom side of horizontal duct section. Provide tapered caps on all horizontal ducts for shedding water.

G. External Duct Insulation Application:
   1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
   2. Secure insulation without vapor barrier with staples, tape, or wires.
   3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
   4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
   5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

3.03 SCHEDULES

A. INDOOR DUCT AND PLENUM APPLICATION SCHEDULE
   1. NOTE: Apply duct lagging where indicated on drawings.
   2. Service: Round, supply-air ducts, concealed.
      a. Material: Mineral-fiber blanket.
      b. Thickness: 2 inches.
      c. Minimum "R" value: 8.
      d. Jacket: Foil and paper.
      e. Vapor Retarder Required: Yes.
   3. Service: Round, return-air ducts, concealed.
      a. Material: Mineral-fiber blanket.
      b. Thickness: 2 inches.
      c. Minimum "R" value: 8.
      d. Jacket: Foil and paper.
      e. Vapor Retarder Required: No.
   4. Service: Round, outside-air ducts, concealed.
      a. Material: Mineral-fiber blanket
      b. Thickness: 2 inches.
      c. Minimum "R" value: 8.
      d. Jacket: Foil and paper.
      e. Vapor Retarder Required: Yes.
   5. Service: Rectangular, supply-air ducts, concealed.
      a. Material: Mineral-fiber blanket
      b. Thickness: 2 inches.
      c. Minimum "R" value: 8.
      d. Jacket: Foil and paper.
      e. Vapor Retarder Required: Yes.
   6. Service: Rectangular, return-air ducts, concealed.
      a. Material: Mineral-fiber blanket
      b. Thickness: 2 inches.
      c. Minimum "R" value: 8.
      d. Jacket: Foil and paper.
      e. Vapor Retarder Required: No.
   7. Service: Rectangular, outside-air ducts, concealed.
      a. Material: Mineral-fiber blanket
      b. Thickness: 2 inches.
      c. Minimum "R" value: 8.
      d. Jacket: Foil and paper.
      e. Vapor Retarder Required: Yes.

8. Service: Round, supply-air ducts, exposed.
    a. Material: Mineral-fiber blanket
    b. Thickness: 2 inches.
    c. Minimum "R" value: 8.
    d. Jacket: Spiral-wound steel, paintable.
    e. Vapor Retarder Required: Yes.
    f. NOTE: Provide double-walled spiral ductwork in areas not concealed above ceilings. and where noted.
9. Service: Round, return-air ducts, exposed.
    a. Material: Mineral-fiber blanket.
    b. Thickness: 2 inches.
    c. Minimum "R" value: 8.
    d. Jacket: Spiral-wound steel, paintable.
    e. Vapor Retarder Required: No.
    f. NOTE: Provide double-walled spiral ductwork in areas not concealed above ceilings. and where noted.
10. Service: Round, outside-air ducts, exposed.
    a. Material: Mineral-fiber blanket.
    b. Thickness: 2 inches.
    c. Minimum "R" value: 8.
    d. Jacket: Spiral-wound steel, paintable.
    e. Vapor Retarder Required: Yes.
    f. NOTE: Provide double-walled spiral ductwork in areas not concealed above ceilings. and where noted.
11. Service: Rectangular, supply-air ducts, exposed.
    a. Material: Mineral-fiber board.
    b. Thickness: 2 inches.
    c. Minimum "R" value: 8.
    d. Jacket: Aluminum, painted to architects specifications.
    e. Vapor Retarder Required: Yes.
12. Service: Rectangular, return-air ducts, exposed.
    a. Material: Mineral-fiber board.
    b. Thickness: 2 inches.
    c. Minimum "R" value: 8.
    d. Jacket: Aluminum, painted to architects specifications.
    e. Vapor Retarder Required: No.
13. Service: Rectangular, outside-air ducts, exposed.
    a. Material: Mineral-fiber board.
    b. Thickness: 2 inches.
    c. Minimum "R" value: 8.
    d. Jacket: Aluminum, painted to architects specifications.
    e. Vapor Retarder Required: Yes.
14. Service: Rectangular, range-hood exhaust ducts, concealed.
    a. Material: Calcium silicate.
    b. Thickness: 2 inches.
    c. Field-Applied Jacket: Glass cloth.
    d. Vapor Retarder Required: No.
15. Service: Rectangular, range-hood exhaust ducts, exposed.
    a. Material: Calcium silicate.
    b. Thickness: 2 inches.
    c. Field Applied Jacket: Stainless steel.
    d. Vapor Retarder Required: No.

B. OUTDOOR DUCT AND PLENUM APPLICATION SCHEDULE
1. Service: Round, supply-air ducts.

a. Material: Mineral-fiber board.
b. Minimum "R" value: 12.
c. Field-Applied Jacket: aluminum
1) Aluminum Thickness: 0.032 inch
d. Vapor Retarder Required: Yes.

2. Service: Round, return-air ducts.
a. Material: Mineral-fiber board.
b. Minimum "R" value: 12.
c. Field-Applied Jacket: aluminum
1) Aluminum Thickness: 0.032 inch
d. Vapor Retarder Required: Yes.

3. Service: Rectangular, supply-air ducts.
a. Material: Mineral-fiber board.
b. Minimum "R" value: 12.
c. Field-Applied Jacket: aluminum
1) Aluminum Thickness: 0.032 inch
d. Vapor Retarder Required: Yes.

4. Service: Rectangular, return-air ducts.
a. Material: Mineral-fiber board.
b. Minimum "R" value: 12.
c. Field-Applied Jacket: aluminum
1) Aluminum Thickness: 0.032 inch
d. Vapor Retarder Required: Yes.

END OF SECTION

SECTION 23 07 19
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 09 90 00 - Painting and Coating: Painting insulation jacket.

C. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

D. Section 23 21 13 - Hydronic Piping: Placement of hangers and hanger inserts.

E. Section 23 23 00 - Refrigerant Piping: Placement of inserts.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

D. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019.

E. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).

F. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2013).

G. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

H. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2017.

I. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2020.

J. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2019.

K. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2017, with Editorial Revision (2018).

L. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2019.

M. ASTM C585 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing; 2010 (Reapproved 2016).

N. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation; 2020.

O. ASTM C610 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation; 2017.

P. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2018).

Q. ASTM D1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber; 2014.

R. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2019.

S. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

T. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

U. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

V. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

2.02 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:
   1. Armacell International: www.armacell.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534 Grade 3; use molded tubular material wherever possible.
   1. Minimum Service Temperature: -40 degrees F.
   2. Maximum Service Temperature: 220 degrees F.
   3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.03 JACKETS

A. PVC Plastic.
   1. Manufacturers:
      a. Johns Manville Corporation: www.jm.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.

c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
d. Thickness: 10 mil.
e. Connections: Brush on welding adhesive.

3. Covering Adhesive Mastic:
   a. Compatible with insulation.

B. ABS Plastic:
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
   a. Minimum Service Temperature: -40 degrees F.
   b. Maximum Service Temperature of 180 degrees F.
   c. Moisture Vapor Permeability: 0.012 perm inch, when tested in accordance with ASTM E96/E96M.
   d. Thickness: 30 mil.
   e. Connections: Brush on welding adhesive.

C. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
1. Thickness: 0.016 inch sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch laps.
4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
6. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

D. Stainless Steel Jacket: ASTM A666, Type 302 stainless steel.
1. Thickness: 0.010 inch.
2. Finish: Smooth.
3. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:
1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

H. Glass fiber insulated pipes conveying fluids above ambient temperature:
1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

I. Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert location: Between support shield and piping and under the finish jacket.
4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.

K. Pipe Not Concealed Above Ceilings: Finish with PVC jacket.

L. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation without jacketing.

M. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

N. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULE

A. PIPING INSULATION SCHEDULES
1. General: Abbreviations used in the following schedules include:
a. Field Applied Jackets: P - PVC, K-Foil and Paper, A - Aluminum, SS - Stainless Steel.
b. Piping Sizes: NPS - Nominal Pipe Size.

B. INTERIOR PIPING APPLICATION SCHEDULE
1. Service: Condensate drain piping.
a. Operating Temperature: 35 to 75 deg F.
b. Insulation Material: Flexible elastomeric.
c. Insulation Thickness: 0.5 inch.
d. Jacket: PVC where not concealed above ceilings.
e. Vapor Retarder Required: Yes.
f. Finish: None.
2. Service: All refrigerant piping.
a. Operating Temperature: 35 to 140 deg F.
b. Insulation Material: Flexible elastomeric.
c. Insulation Thickness: Apply the following insulation thicknesses:
1) Pipe, 1” or less: 1.0 inch.
2) Pipe, 1-1/4” and up: 1.5 inch.
d. Jacket: PVC where not concealed above ceilings.
e. Vapor Retarder Required: Yes.
f. Finish: None.

C. EXTERIOR PIPING INSULATION APPLICATION SCHEDULE
1. Service: All refrigerant piping.
a. Operating Temperature: 35 to 140 deg F.
b. Insulation Material: Flexible elastomeric.

c. Insulation Thickness: Apply the following insulation thicknesses:
   1) Pipe, 1” or less: 1.0 inch.
   2) Pipe, 1-1/4” to 2”: 1.5 inch.
   3) Pipe, 2-1/2” and up: 1.5 inch.
d. Jacket: Aluminum.
e. Vapor Retarder Required: Yes.
f. Finish: None.

END OF SECTION

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SECTION 23 09 13
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Thermostats, Temperature Sensors, Humidity Sensors

B. Carbon Dioxide Sensors.

C. Automatic dampers.

D. Damper operators.

E. Miscellaneous accessories.

1.02 RELATED REQUIREMENTS

A. Section 23 21 13 - Hydronic Piping: Installation of control valves, flow switches, temperature sensor sockets, gage taps.

B. Section 23 33 00 - Air Duct Accessories: Installation of automatic dampers.

C. Section 23 09 23 - Direct-Digital Control System for HVAC.

D. Section 23 09 93 - Sequence of Operations for HVAC Controls.

1.03 REFERENCE STANDARDS

A. Input/Output Sensors:

B. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.

D. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

E. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2020.

F. ASTM D1693 - Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics; 2015, with Editorial Revision (2020).

G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

H. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2014.

I. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

J. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

D. Manufacturer's Instructions: Provide for all manufactured components.

E. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.

F. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

G. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.

H. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Substantial Completion.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 CONTROL PANELS

A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.

B. NEMA 250, general purpose utility enclosures with enamelled finished face panel.

C. Provide common keying for all panels.

2.03 DAMPERS

A. Performance: Test in accordance with AMCA 500-D.

B. Frames: Galvanized steel, welded or riveted with corner reinforcement, minimum 12 gage.

C. Blades: Galvanized steel, maximum blade size 8 inches wide, 48 inches long, minimum 22 gage, attached to minimum 1/2 inch shafts with set screws.

D. Blade Seals: Synthetic elastomeric inflatable mechanically attached, field replaceable.

E. Jamb Seals: Spring stainless steel.

F. Shaft Bearings: Oil impregnated sintered bronze.

G. Linkage Bearings: Oil impregnated sintered bronze.

H. Leakage: Less than one percent based on approach velocity of 2000 ft/min and 4 inches wg.

I. Maximum Pressure Differential: 6 inches wg.

J. Temperature Limits: -40 to 200 degrees F.

2.04 DAMPER OPERATORS

A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
   1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
   2. Provide one operator for maximum 36 sq ft damper section.

B. Electric Operators:
   1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.

2.05 INPUT/OUTPUT SENSORS

A. Temperature Sensors:
   1. Room temperature sensors in common areas (restrooms, locker rooms, corridors, vestibules, etc.) shall be field-installed flat plate sensors with no possible adjustment or display. VRF unit controllers shall be mounted above the ceiling at the unit and a flat-plate temperature sensor is to be extended and wall-mounted within the space by the BAS contractor. Security screws shall be used in institutional settings as deemed necessary by the design engineer. ATC contractor shall coordinate requirements with the design engineer during the submittal process. Provide insulated base. Following sensing elements are acceptable:
      a. Sensing element - Platinum RTD, Thermistor, or integrated circuit, +/- 0.8°F accuracy at calibration point.
      b. All other areas shall utilize the standard VRF room-level controller for temperature response.
   2. Single point duct temperature sensor shall consist of sensing element, junction box for wiring connections and gasket to prevent air leakage or vibration noise. Temperature range as required for resolution indicated in paragraph A. Sensor probe shall be 316 stainless steel.
      a. Sensing element - Platinum RTD, Thermistor, or integrated circuit, +/- 0.8°F accuracy at calibration point.
   3. Averaging duct temperature sensor shall consist of an averaging element, junction box for wiring connections and gasket to prevent air leakage. Provide enough sensors to give one lineal foot of sensing element for each square foot of cooling coil face area. Temperature range as required for resolution indicated in paragraph A.
      a. Sensing element - Platinum RTD, Thermistor, or integrated circuit, +/- 0.8°F accuracy at calibration point.
   4. Room Sensors Covers: Locking with slide-bar set point adjustment, and concealed setpoint, without thermometer.

B. Humidity Sensors:
   1. Duct Mounted Sensor: Voltage type encased in a die-cast metal, weather-proof housing.
      a. Input Power, Voltage Type: Class 2; 12-30 VDC/24 VAC, 15mA max.
      b. Input Power, mA Type: Class 2; Loop powered 12-30 VDC only, 30 mA max.
      c. Output Voltage type: 3-wire observed polarity.
      d. Output mA type: 2-wire, not polarity sensitive (clipped and capped).
      e. Humidity:
         1) HS Element: Digitally profiled thin-film capacitive.
         2) Accuracy 1 percent at 10 to 90 percent relative humidity at 77 degrees F, multi-point calibration, NIST traceable.
            (a) Plus/minus 1 percent at 20-40 percent RH in mA output mode; (multi-point calibration, NIST traceable).
         3) Scaling: 0-100 percent RH.
      f. Temperature Effect:
         1) Duct Mounted: Plus/minus 0.18 percent per degree F.

2) Outdoor Mounted: 4-20mA version: (0.0013x%RHx(TdegreeC-25)).
g. Hysteresis: 1.5 percent typical.
h. Linearity: Included in accuracy specification.
i. Reset Rate: 24 hours.
j. Stability: Plus/minus 1 percent @ 68 degrees F (20 degrees C) annually, for two years.
k. Temperature Monitoring:
1) Temperature Transmitter Output: Digital, 4-20mA (clipped & capped) or 0-5V/0-10V output.
(a) HO Transmitter Accuracy: Plus/minus 2.3 degrees F.
(b) HD Transmitter Accuracy: Plus/minus 1.0 degree F.
l. Operating Environment:
1) Operating Humidity Range: 0 to 100 percent RH noncondensing.
2) Operating Temperature Range: Minus 40 degrees F to 122 degrees F.
2. Wall Mounted Sensor: Voltage type encased in a High impact ABS plastic housing.
a. Input Power, Voltage Type: Class 2; 12-24 VDC/24 VAC.
3. Elements: Accurate within 5 percent full range with linear output.
4. Room Sensors: With locking cover , span of 10 to 60 percent relative humidity.
5. Duct and Outside Air Sensors: With element guard and mounting plate, range of 0 - 100 percent relative humidity.

C. Damper Position Indication: Potentiometer mounted in enclosure with adjustable crank arm assembly connected to damper to transmit 0 - 100 percent damper travel.

D. Carbon Dioxide Sensors:
1. General: Provide non-dispersive infrared (NDIR), diffusion sampling CO2 sensors with integral transducers and linear output.
a. Linear, CO2 Concentration Range Display: 0 to 2000 / 5000 ppm, programmable.
b. Accuracy: Plus/minus 30 ppm or plus/minus 2 percent of measured value, measured at NTP.
c. Repeatability: Plus/minus 20 ppm or plus/minus 2 percent of measured value.
d. Response Time: Less than 60 seconds for 90 percent step change.
e. Communication Protocol: Modbus or BACnet.
2. Air Temperature: Range of 32 to 122 degrees F.
3. Relative Humidity: Range of 0 to 95 percent (non-condensing).
4. Power Input: Class 2; 12 to 30VDC or 24VAC 50/60 Hz; 100mA max.
5. Calibration Characteristics:
a. Automatically compensating algorithm for sensor drift due to sensor degradation.
b. Maximum Drift: 2 percent.
c. User calibratable with a minimum calibration interval of 5 years.
6. Construction:
a. Sensor Chamber: Non-corrosive material for neutral effect on carbon dioxide sample.
b. Provide duct mounted sensors with duct probe designed to protect sensing element from dust accumulation and mechanical damage.
c. Housing: High impact plastic, UL 94 VO.

E. Equipment Operation Sensors:
1. Status Inputs for Fans: Differential pressure switch with adjustable range of 0 to 5 inches wg.
2. Status Inputs for Pumps: Differential pressure switch piped across pump with adjustable pressure differential range of 8 to 60 psi.
3. Status Inputs for Electric Motors: Current sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

F. Carbon Dioxide Level Sensors:
1. Wall or duct-mounted as required by control sequence or plans.

2. Demand-control ventilation sensor for measuring and transmitting CO2 levels ranging from 0-2,000 ppm.
3. Single-beam, dual-wavelength design with five-year stability for calibration..
4. Proportional output, 4-20 mA signal.

2.06 THERMOSTATS

A. Line Voltage Thermostats:
   1. Integral manual On/Off/Auto selector switch, single or two pole as required.
   2. Dead band: Maximum 2 degrees F.
   3. Cover: Locking with set point adjustment, with thermometer.
   4. Rating: Motor load.

B. Outdoor Reset Thermostat:
   1. Remote bulb or bimetal rod and tube type, proportioning action with adjustable throttling range, adjustable setpoint.
   2. Scale range: -10 to 70 degrees F.

C. Airstream Thermostats:
   1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in middle of range and adjustable throttling range.
   2. Averaging service remote bulb element: 7.5 feet.

D. Electric Low Limit Duct Thermostat:
   1. Snap acting, single pole, single throw, manual reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below setpoint,

E. Electric High Limit Duct Thermostat:
   1. Snap acting, single pole, single throw, manual reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or above setpoint,
   2. Bulb length: Minimum 20 feet.
   3. Provide one thermostat for every 20 sq ft of coil surface.

F. Fire Thermostats:
   1. UL labeled, factory set in accordance with NFPA 90A.
   2. Normally closed contacts, manual reset.

G. Heating/Cooling Valve Top Thermostats:
   1. Proportional acting for proportional flow, molded rubber diaphragm, remote bulb liquid filled element, direct and reverse acting at differential pressure to 25 psig, cast housing with position indicator and adjusting knob.

2.07 TRANSMITTERS

A. Pressure Transmitters:
   1. One pipe direct acting indicating type for gas, liquid, or steam service, range suitable for system, proportional electronic output.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

C. Beginning of installation means installer accepts existing conditions.

D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

F. Ensure installation of components is complementary to installation of similar components.

G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats with plans and room details before installation. Locate 48 inches above floor. Align with lighting switches, CO2 sensors, and humidistats. Refer to Section 26 27 26.

C. Mount freeze protection thermostats using flanges and element holders.

D. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

E. Provide separable sockets for liquids and flanges for air bulb elements.

F. Provide thermostats in aspirating boxes in front entrances, gymnasiums, high security areas, and where indicated.

3.03 MAINTENANCE

A. See Section 01 70 00 - Execution Requirements, for additional requirements relating to maintenance service.

B. Provide service and maintenance of control system for two years from Date of Substantial Completion.

C. Provide complete service of controls systems, including call backs, and submit written report of each service call.

END OF SECTION

SECTION 23 09 23

DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

.01 NOTE: CONTRACOR IS REQUIRED TO PROVIDE ALL COMPONENTS, WIRING, LABOR, APPURTENANCES, AND COORDINATION SERVICES TO DELIVER A FULLY-FUCNTIONAL BUILDING AUTOMATION SYSTEM. COORDINATE HVAC CONTROL COMPONENTS PROVIDED WITH EQUIPMENT TO SEEMLESSLY INTEGRATE WITH BUILDING AUTOMATION SYSTEM.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. System Description
B. Operator Interface
C. Controllers
D. Power Supplies and Line Filtering
E. System Software
F. Controller Software
G. HVAC Control Programs
H. Control equipment.
I. Software.

1.02 RELATED REQUIREMENTS

A. Section 28 31 00 - Fire Detection and Alarm.
B. Section 23 09 13 - Instrumentation and Control Devices for HVAC.
C. Section 23 09 93 - Sequence of Operations for HVAC Controls.
D. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.
E. Section 27 52 23.50 - Educational Intercommunication's and Programs - Education For Sustainability Systems

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SYSTEM DESCRIPTION

A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units.
B. The BAS contractor shall provide all interconnecting wiring, interfaces, and programming required to completely integrate the VRF system, packaged DOAS unit, packaged RTUs, pool dehumidfication system, and other components into the building automation system and achieve full read / write capability of all points from the BAS operator workstation.
    1. Note - All points as available at the VRF control workstation shall be availalbe via the buldiing automation system portal. The BAS contractor is responsible for achieving the specified sequences of operations.
C. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.
D. Include computer software and all hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.
E. Controls for variable refrigerant flow (VRF) system, packaged rooftop units, radiation, reheat coils, unit heaters, fan coils, and the like when directly connected to the control units. Individual terminal unit control is specified in Section 23 09 13.

F. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment, power transformers and electrical feeds, and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.

G. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for each system component and software module.

C. Shop Drawings:
1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
2. List connected data points, including connected control unit and input device.
3. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.
4. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
5. Indicate description and sequence of operation of operating, user, and application software.

D. Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.

E. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
1. Revise shop drawings to reflect actual installation and operating sequences.
2. Include submittals data in final "Record Documents" form.

F. Operation and Maintenance Data:
1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with NFPA 70.

B. Design system software under direct supervision of a Professional Engineer experienced in design of this Work and licensed at the State in which the Project is located.

C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum 10 years documented experience.

D. Installer Qualifications: Company specializing in performing the work of this section 5 years documented experience approved by manufacturer.

E. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.07 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this Section.

B. Require attendance of parties directly affecting the work of this Section.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Substantial Completion.

C. Provide five year manufacturer's warranty for field programmable micro-processor based units.

1.09 MAINTENANCE SERVICE

A. Provide service and maintenance of energy management and control systems for two years from Date of Substantial Completion.

B. Provide four complete inspections per year, two in each season, to inspect, calibrate, and adjust controls as required, and submit written reports.

C. Provide complete service of systems, including call backs. Make minimum of 4 complete normal inspections of approximately 4 hours duration in addition to normal service calls to inspect, calibrate, and adjust controls, and submit written reports.

1.10 EXTRA MATERIALS

A. See Section 01 6000 - Product Requirements, for additional provisions.

1.11 PROTECTION OF SOFTWARE RIGHTS

A. Prior to delivery of software, the Owner and the party providing the software will enter into a software license agreement with provisions for the following:
   1. Limiting use of software to equipment provided under these specifications.
   2. Limiting copying.
   3. Preserving confidentiality.
   4. Prohibiting transfer to a third party.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Johnson Controls, Inc by Modern Controls - Tridium

B. Johnson Controls, Inc, Mid Atlantic Regional - Tridium

C. Substitutions: Not Permitted.

2.02 SYSTEM DESCRIPTION

A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units with communications to existing district-wide Building Management System.

B. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.

C. Include computer software and hardware, operator input/output devices, control units, dedicated local area networks (LAN), sensors, control devices, actuators.

D. Controls for variable air volume terminals, radiation, reheat coils, unit heaters, fan coils, and the like when directly connected to the control units. Individual terminal unit control is specified in Section 23 09 13.

E. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.

F. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

2.03 CONTROLLERS

A. BUILDING LEVEL CONTROLLERS
   1. General:

a. Manage global strategies by one or more, independent, standalone, microprocessor based controllers.
b. Provide sufficient memory to support controller's operating system, database, and programming requirements.
c. Share data between networked controllers.
d. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
e. Utilize real-time clock for scheduling.
f. Continuously check processor status and memory circuits for abnormal operation.
g. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
h. Communication with other network devices to be based on assigned protocol.

2. Communication:
a. Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol.
b. Perform routing when connected to a network of custom application and application specific controllers.
c. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.

3. Anticipated Environmental Ambient Conditions:
a. Outdoors and/or in Wet Ambient Conditions:
1) Mount within waterproof enclosures.
2) Rated for operation at 40 to 150 degrees F.
b. Conditioned Space:
1) Mount within dustproof enclosures.
2) Rated for operation at 32 to 120 degrees F.

4. Provisions for Serviceability:
a. Diagnostic LEDs for power, communication, and processor.
b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.

5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.

6. Power and Noise Immunity:
a. Maintain operation at 90 to 110 percent of nominal voltage rating.
b. Perform orderly shutdown below 80 percent of nominal voltage.
c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.

B. CUSTOM APPLICATION CONTROLLERS

1. General:
a. Provide sufficient memory to support controller's operating system, database, and programming requirements.
b. Share data between networked, microprocessor based controllers.
c. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
d. Utilize real-time clock for scheduling.
e. Continuously check processor status and memory circuits for abnormal operation.
f. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
g. Communication with other network devices to be based on assigned protocol.

2. Communication:
a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.

b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.

3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
      1) Mount within waterproof enclosures.
      2) Rated for operation at 40 to 150 degrees F.
   b. Conditioned Space:
      1) Mount within dustproof enclosures.
      2) Rated for operation at 32 to 120 degrees F.
4. Provisions for Serviceability:
   a. Diagnostic LED's for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.

C. APPLICATION SPECIFIC CONTROLLERS
1. General:
   a. Not fully user programmable, microprocessor based controllers dedicated to control specific equipment.
   b. Customized for operation within the confines of equipment served.
   c. Communication with other network devices to be based on assigned protocol.
2. Communication:
   a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
   b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
      1) Mount within waterproof enclosures.
      2) Rated for operation at 40 to 150 degrees F.
   b. Conditioned Space:
      1) Mount within dustproof enclosures.
      2) Rated for operation at 32 to 120 degrees F.
4. Provisions for Serviceability:
   a. Diagnostic LEDs for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 3 feet.

D. INPUT/OUTPUT INTERFACE
1. Hardwired inputs and outputs tie into the DDC system through building, custom application, or application specific controllers.
2. All Input/Output Points:

a. Protect controller from damage resulting from any point short-circuiting or grounding and from voltage up to 24 volts of any duration.
b. Provide universal type for building and custom application controllers where input or output is software designated as either binary or analog type with appropriate properties.

3. Binary Inputs:
   a. Allow monitoring of On/Off signals from remote devices.
   b. Provide wetting current of 12 mA minimum, compatible with commonly available control devices and protected against the effects of contact bounce and noise.
   c. Sense dry contact closure with power provided only by the controller.
4. Pulse Accumulation Input Objects: Conform to all requirements of binary input objects and accept up to 10 pulses per second.
5. Analog Inputs:
   a. Allow for monitoring of low voltage 0 to 10 VDC, 4 to 20 mA current, or resistance signals (thermistor, RTD).
   b. Compatible with and field configurable to commonly available sensing devices.
6. Binary Outputs:
   a. Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control.
   b. Outputs provided with three position (On/Off/Auto) override switches.
   c. Status lights for building and custom application controllers to be selectable for normally open or normally closed operation.
7. Analog Outputs:
   a. Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control.
   b. Provide status lights and two position (AUTO/MANUAL) switch for building and custom application controllers with manually adjustable potentiometer for manual override on building and custom application controllers.
   c. Drift to not exceed 0.4 percent of range per year.
8. Tri State Outputs:
   a. Coordinate two binary outputs to control three point, floating type, electronic actuators without feedback.
   b. Limit the use of three point, floating devices to the following zone and terminal unit control applications:
      1) VAV or duct terminal units.
      2) Duct mounted heating coils.
      3) Zone dampers.
      4) Radiation.
   c. Control algorithms run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.
9. System Object Capacity:
   a. System size to be expandable to twice the number of input output objects required by providing additional controllers, including associated devices and wiring.
   b. Hardware additions or software revisions for the installed operator interfaces are not to be required for future, system expansions.

2.04 POWER SUPPLIES AND LINE FILTERING

A. Power Supplies:
   1. Provide UL listed control transformers with Class 2 current limiting type or over-current protection in both primary and secondary circuits for Class 2 service as required by the NEC.
   2. Limit connected loads to 80 percent of rated capacity.
   3. Match DC power supply to current output and voltage requirements.
   4. Unit to be full wave rectifier type with output ripple of 5.0 mV maximum peak to peak.

5. Regulation to be 1 percent combined line and load with 100 microsecond response time for 50 percent load changes.
6. Provide over-voltage and over-current protection to withstand a 150 percent current overload for 3 seconds minimum without trip-out or failure.
7. Operational Ambient Conditions: 32 to 120 degrees F.
8. EM/RF meets FCC Class B and VDE 0871 for Class B and MIL-STD 810 for shock and vibration.
9. Line voltage units UL recognized and CSA approved.

B. Power Line Filtering:
1. Provide external or internal transient voltage and surge suppression component for all workstations and controllers.
2. Minimum surge protection attributes:
a. Dielectric strength of 1000 volts minimum.
b. Response time of 10 nanoseconds or less.
c. Transverse mode noise attenuation of 65 dB or greater.
d. Common mode noise attenuation of 150 dB or greater at 40 to 100 Hz.

2.05 CONTROL UNITS

A. Units: Modular in design and consisting of processor board with programmable RAM memory, local operator access and display panel, and integral interface equipment.

B. Battery Backup: For minimum of 48 hours for complete system including RAM without interruption, with automatic battery charger.

C. Control Units Functions:
1. Monitor or control each input/output point.
2. Completely independent with hardware clock/calendar and software to maintain control independently.
3. Acquire, process, and transfer information to operator station or other control units on network.
4. Accept, process, and execute commands from other control unit's or devices or operator stations.
5. Access both data base and control functions simultaneously.
6. Record, evaluate, and report changes of state or value that occur among associated points. Continue to perform associated control functions regardless of status of network.
7. Perform in stand-alone mode:
a. Start/stop.
b. Duty cycling.
c. Automatic Temperature Control.
d. Demand control via a sliding window, predictive algorithm.
e. Event initiated control.
f. Calculated point.
g. Scanning and alarm processing.
h. Full direct digital control.
i. Trend logging.
j. Global communications.
k. Maintenance scheduling.

D. Global Communications:
1. Broadcast point data onto network, making that information available to all other system control units.
2. Transmit any or all input/output points onto network for use by other control units and utilize data from other control units.

E. Input/Output Capability:
1. Discrete/digital input (contact status).
2. Discrete/digital output.

3. Analog input.
4. Analog output.
5. Pulse input (5 pulses/second).
6. Pulse output (0-655 seconds in duration with 0.01 second resolution).

F. Monitor, control, or address data points. Mix shall include analog inputs, analog outputs, pulse inputs, pulse outputs and discrete inputs/outputs, as required. Install control unit's with minimum 30 percent spare capacity.

G. Point Scanning: Set scan or execution speed of each point to operator selected time from 1 to 250 seconds.

H. Upload/Download Capability: Download from or upload to operator station. Upload/Download time for entire control unit database maximum 10 seconds on hard wired LAN, or 60 seconds over voice grade phone lines.

I. Test Mode Operation: Place input/output points in test mode to allow testing and developing of control algorithms on line without disrupting field hardware and controlled environment. In test mode:
1. Inhibit scanning and calculation of input points. Issue manual control to input points (set analog or digital input point to operator determined test value) from work station.
2. Control output points but change only data base state or value; leave external field hardware unchanged.
3. Enable control actions on output points but change only data base state or value.

J. Local display and adjustment panel: Portable control unit, containing digital display, and numerical keyboard. Display and adjust:
1. Input/output point information and status.
2. Controller set points.
3. Controller tuning constants.
4. Program execution times.
5. High and low limit values.
6. Limit differential.
7. Set/display date and time.
8. Control outputs connected to the network.
9. Automatic control outputs.
10. Perform control unit diagnostic testing.
11. Points in "Test" mode.

2.06 LOCAL AREA NETWORK (LAN)

A. Provide communication between control units over dedicated local area network (LAN).

B. LAN Capacity: Not less than 100 stations or nodes.

C. Break in Communication Path: Alarm and automatically initiate LAN reconfiguration.

D. LAN Data Speed: Minimum 19.2 Kb.

E. Communication Techniques: Allow interface into network by multiple operation stations and by auto-answer/auto-dial modems. Support communication over telephone lines utilizing modems.

F. Transmission Median: Fiber optic or single pair of solid 24 gauge twisted, shielded copper cable.

G. Network Support: Time for global point to be received by any station, shall be less than 3 seconds. Provide automatic reconfiguration if any station is added or lost. If transmission cable is cut, reconfigure two sections with no disruption to system's operation, without operator intervention.

2.07 SYSTEM SOFTWARE

A. Operating System:
1. Concurrent, multi-tasking capability.
a. Common Software Applications Supported: Microsoft Excel.

2. System Graphics:
    a. Allow up to 10 graphic screens, simultaneously displayed for comparison and monitoring of system status.
    b. Animation displayed by shifting image files based on object status.
    c. Provide method for operator with password to perform the following:
        1) Move between, change size, and change location of graphic displays.
        2) Modify on-line.
        3) Add, delete, or change dynamic objects consisting of:
            (a) Analog and binary values.
            (b) Dynamic text.
            (c) Static text.
            (d) Animation files.
3. Custom Graphics Generation Package:
    a. Create, modify, and save graphic files and visio format graphics in PCX formats.
    b. HTML graphics to support web browser compatible formats.
    c. Capture or convert graphics from AutoCAD.
4. Standard HVAC Graphics Library:
    a. HVAC Equipment:
        1) Air Handlers.
        2) Terminal HVAC Units.
        3) Fan Coil Units.
        4) VRF Fan Coils.
        5) VRF Heat Pumps.
        6) Energy Recovery Ventilators with Electric Duct Heating Coils.
        7) Packaged Rooftop Units.
    b. Ancillary Equipment:
        1) Fans.
        2) Pumps.
        3) Coils.
        4) Valves.
        5) Piping.
        6) Dampers.
        7) Ductwork.
    c. File Format Compatible with Graphics Generation Package Program.

B. Workstation System Applications:
1. Automatic System Database Save and Restore Functions:
    a. Current database copy of each Building Controller is automatically stored on hard disk.
    b. Automatic update occurs upon change in any system panel.
    c. In the event of database loss in any system panel, the first workstation to detect the loss automatically restores the database for that panel unless disabled by the operator.
2. Manual System Database Save and Restore Functions by Operator with Password Clearance:
    a. Save database from any system panel.
    b. Clear a panel database.
    c. Initiate a download of a specified database to any system panel.
3. Software provided allows system configuration and future changes or additions by operators under proper password protection.
4. On-line Help:
    a. Context-sensitive system assists operator in operation and editing.
    b. Available for all applications.
    c. Relevant screen data provided for particular screen display.
    d. Additional help available via hypertext.

5. Security:
    a. Operator log-on requires user name and password to view, edit, add, or delete data.
    b. System security selectable for each operator.
    c. System supervisor sets passwords and security levels for all other operators.
    d. Operator passwords to restrict functions accessible to viewing and/or changing system applications, editor, and object.
    e. Automatic, operator log-off results from keyboard or mouse inactivity during user-adjustable, time period.
    f. All system security data stored in encrypted format.
6. System Diagnostics:
    a. Operations Automatically Monitored:
        1) Workstations.
        2) Printers.
        3) Modems.
        4) Network connections.
        5) Building management panels.
        6) Controllers.
    b. Device failure is annunciated to the operator.
7. Alarm Processing:
    a. All system objects are configurable to "alarm in" and "alarm out" of normal state.
    b. Configurable Objects:
        1) Alarm limits.
        2) Alarm limit differentials.
        3) States.
        4) Reactions for each object.
8. Alarm Messages:
    a. Descriptor: English language.
    b. Recognizable Features:
        1) Source.
        2) Location.
        3) Nature.
9. Configurable Alarm Reactions by Workstation and Time of Day:
    a. Logging.
    b. Printing.
    c. Starting programs.
    d. Displaying messages.
    e. Dialing out to remote locations.
    f. Paging.
    g. Providing audible annunciation.
    h. Displaying specific system graphics.
10. Custom Trend Logs:
    a. Definable for any data object in the system including interval, start time, and stop time.
    b. Trend Data:
        1) Sampled and stored on the building controller panel.
        2) Archivable on hard disk.
        3) Retrievable for use in reports, spreadsheets and standard database programs.
        4) Archival on LAN accessible storage media including hard disk, tape, Raid array drive, and virtual cloud environment.
        5) Protected and encrypted format to prevent manipulation, or editing of historical data and event logs.
11. Alarm and Event Log:
    a. View all system alarms and change of states from any system location.
    b. Events listed chronologically.

c. Operator with proper security acknowledges and clears alarms.
d. Alarms not cleared by operator are archived to the workstation hard disk.

12. Object, Property Status and Control:
    a. Provide a method to view, edit if applicable, the status of any object and property in the system.
    b. Status Available by the Following Methods:
        1) Menu.
        2) Graphics.
        3) Custom Programs.
13. Reports and Logs:
    a. Reporting Package:
        1) Allows operator to select, modify, or create reports.
        2) Definable as to data content, format, interval, and date.
        3) Archivable to hard disk.
    b. Real-time logs available by type or status such as alarm, lockout, normal, etc.
    c. Stored on hard disk and readily accessible by standard software applications, including spreadsheets and word processing.
    d. Set to be printed on operator command or specific time(s).
14. Reports:
    a. Standard:
        1) Objects with current values.
        2) Current alarms not locked out.
        3) Disabled and overridden objects, points and SNVTs.
        4) Objects in manual or automatic alarm lockout.
        5) Objects in alarm lockout currently in alarm.
        6) Logs:
            (a) Alarm History.
            (b) System messages.
            (c) System events.
            (d) Trends.
    b. Custom:
        1) Daily.
        2) Weekly.
        3) Monthly.
        4) Annual.
        5) Time and date stamped.
        6) Title.
        7) Facility name.
    c. Tenant Override:
        1) Monthly report showing total, requested, after-hours HVAC and lighting services on a daily basis for each tenant.
        2) Annual report showing override usage on a monthly basis.
    d. Electrical, Fuel, and Weather:
        1) Electrical Meter(s):
            (a) Monthly showing daily electrical consumption and peak electrical demand with time and date stamp for each meter.
            (b) Annual summary showing monthly electrical consumption and peak demand with time and date stamp for each meter.
        2) Fuel Meter(s):
            (a) Monthly showing daily natural gas consumption for each meter.
            (b) Annual summary showing monthly consumption for each meter.
        3) Weather:
            (a) Monthly showing minimum, maximum, average outdoor air temperature and heating/cooling degree-days for the month.

C. Workstation Applications Editors:
   1. Provide editing software for all system applications at the PC workstation.
   2. Downloaded application is executed at controller panel.
   3. Full screen editor for each application allows operator to view and change:
      a. Configuration.
      b. Name.
      c. Control parameters.
      d. Set-points.
   4. Scheduling:
      a. Monthly calendar indicates schedules, holidays, and exceptions.
      b. Allows several related objects to be scheduled and copied to other objects or dates.
      c. Start and stop times adjustable from master schedule.
   5. Custom Application Programming:
      a. Create, modify, debug, edit, compile, and download custom application programming during operation and without disruption of all other system applications.
      b. Programming Features:
         1) English oriented language, based on BASIC, FORTRAN, C, or PASCAL syntax allowing for free form programming.
         2) Alternative language graphically based using appropriate function blocks suitable for all required functions and amenable to customizing or compounding.
         3) Insert, add, modify, and delete custom programming code that incorporates word processing features such as cut/paste and find/replace.
         4) Allows the development of independently, executing, program modules designed to enable and disable other modules.
         5) Debugging/simulation capability that displays intermediate values and/or results including syntax/execution error messages.
         6) Support for conditional statements (IF/THEN/ELSE/ELSE-F) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
         7) Support for floating-point arithmetic utilizing plus, minus, divide, times, square root operators; including absolute value; minimum/maximum value from a list of values for mathematical functions.
         8) Language consisting of resettable, predefined, variables representing time of day, day of the week, month of the year, date; and elapsed time in seconds, minutes, hours, and days where the variable values cab be used in IF/THEN comparisons, calculations, programming statement logic, etc.
         9) Language having predefined variables representing status and results of the system software enables, disables, and changes the set points of the controller software.

2.08 CONTROLLER SOFTWARE

A. All applications reside and operate in the system controllers and editing of all applications occurs at the operator workstation.

B. System Security:
   1. User access secured via user passwords and user names.
   2. Passwords restrict user to the objects, applications, and system functions as assigned by the system manager.
   3. User Log On/Log Off attempts are recorded.
   4. Automatic Log Off occurs following the last keystroke after a user defined delay time.

C. Object or Object Group Scheduling:
   1. Weekly Schedules Based on Separate, Daily Schedules:
      a. Include start, stop, optimal stop, and night economizer.
      b. 10 events maximum per schedule.
      c. Start/stop times adjustable for each group object.

2. Exception Schedules:
    a. Based on any day of the year.
    b. Defined up to one year in advance.
    c. Automatically discarded and replaced with standard schedule for that day of the week upon execution.
3. Holiday or Special Schedules:
    a. Capability to define up to 99 schedules.
    b. Repeated annually.
    c. Length of each period is operator defined.

D. Provide standard application for equipment coordination and grouping based on function and location to be used for scheduling and other applications.

E. Alarms:
1. Binary object is set to alarm based on the operator specified state.
2. Analog object to have high/low alarm limits.
3. All alarming is capable of being automatically and manually disabled.
4. Alarm Reporting:
    a. Operator determines action to be taken for alarm event.
    b. Alarms to be routed to appropriate workstation.
    c. Reporting Options:
        1) Start programs.
        2) Print.
        3) Logged.
        4) Custom messaging.
        5) Graphical displays.
        6) Dial out to workstation receivers via system protocol.

F. Demand Limiting:
1. Building power consumption monitored from signals generated by a pulse generator, mounted at the building power meter.
2. Demand limit controlled via load shedding or load restoration in a predetermined and predictive manner.
3. Demand Reduction Methods:
    a. Supply air temperature reset.
    b. Space temperature set-point reset.
    c. Equipment off/on prioritization.
4. Relevant variables that influence demand limiting control are based on the power company methodology for computing demand charges.
5. Operator On-Line Changes Allowed:
    a. Addition and deletion of loads controlled.
    b. Changes in demand intervals.
    c. Changes in demand limit for meter(s).
    d. Maximum equipment shutoff time.
    e. Minimum equipment shutoff time.
    f. Select rotational or sequential shedding and restoring.
    g. Shed/restore priority.
6. Information and Reports available Hourly, Daily, and Monthly:
    a. Total electric consumption.
    b. Peak demand.
    c. Date and time of peak demand.
    d. Daily peak demand.

G. Maintenance Management: System monitors equipment status and generates maintenance messages based upon user-designated run-time limits.

H. Sequencing: Application software based upon specified sequences of operation in Section 23 09 93.

I. PID Control Characteristics:
   1. Direct or reverse action.
   2. Anti-windup.
   3. Calculated, time-varying, analog value, positions an output or stages a series of outputs.
   4. User selectable controlled variable, set-point, and PED gains.

J. Staggered Start Application:
   1. Prevents all controlled equipment from simultaneously restarting after power outage.
   2. Order of equipment startup is user selectable.

K. Energy Calculations:
   1. Accumulated instantaneous power or flow rates are converted to energy use data.
   2. Algorithm calculates a rolling average and allows window of time to be user specified in minute intervals.
   3. Algorithm calculates a fixed window average with a digital input signal from a utility meter defining the start of the window period that in turn synchronizes the fixed-window average with that used by the power company.

L. Anti-Short Cycling:
   1. All binary output objects protected from short-cycling.
   2. Allows minimum on-time and off-time to be selected.

M. On-Off Control with Differential:
   1. Algorithm allows binary output to be cycled based on a controlled variable and set-point.
   2. Algorithm to be direct-acting or reverse-acting incorporating an adjustable differential.

N. Run-Time Totalization:
   1. Totalize run-times for all binary input objects.
   2. Provides operator with capability to assign high run-time alarm.

2.09 OPERATING SYSTEM SOFTWARE

A. Input/Output Capability From Operator Station:
   1. Request display of current values or status in tabular or graphic format.
   2. Command selected equipment to specified state.
   3. Initiate logs and reports.
   4. Change analog limits.
   5. Add, delete, or change points within each control unit or application routine.
   6. Change point input/output descriptors, status, alarm descriptors, and engineering unit descriptors.
   7. Add new control units to system.
   8. Modify and set up maintenance scheduling parameters.
   9. Develop, modify, delete or display full range of color graphic displays.
   10. Automatically archive select data even when running third party software.
   11. Provide capability to sort and extract data from archived files and to generate custom reports.
   12. Support two printer operations.
      a. Alarm printer: Print alarms, operator acknowledgements, action messages, system alarms, operator sign-on and sign-off.
      b. Data printer: Print reports, page prints, and data base prints.
   13. Select daily, weekly or monthly as scheduled frequency to synchronize time and date in digital control units. Accommodate daylight savings time adjustments.
   14. Print selected control unit data base.

B. Operator System Access: Via software password with minimum 30 access levels at work station and minimum 3 access levels at each control unit.

C. Data Base Creation and Support: Changes shall utilize standard procedures. Control unit shall automatically check work station data base files upon connection and verify data base match. Minimum capability shall include:

1. Add and delete points.
2. Modify any point parameter.
3. Change, add, or delete English language descriptors.
4. Add, modify, or delete alarm limits.
5. Add, modify, or delete points in start/stop programs, trend logs, etc.
6. Create custom relationship between points.
7. Create or modify DDC loops and parameters.
8. Create or modify override parameters.
9. Add, modify, and delete any applications program.
10. Add, delete, develop, or modify dynamic color graphic displays.

D. Dynamic Color Graphic Displays:
1. Utilizes custom symbols or system supported library of symbols.
2. Sixteen (16) colors.
3. Sixty (60) outputs of real time, live dynamic data per graphic.
4. Dynamic graphic data.
5. 1,000 separate graphic pages.
6. Modify graphic screen refresh rate between 1 and 60 seconds.

E. Operator Station:
1. Accept data from LAN as needed without scanning entire network for updated point data.
2. Interrogate LAN for updated point data when requested.
3. Allow operator command of devices.
4. Allow operator to place specific control units in or out of service.
5. Allow parameter editing of control units.
6. Store duplicate data base for every control unit and allow down loading while system is on line.
7. Control or modify specific programs.
8. Develop, store and modify dynamic color graphics.
9. Provide data archiving of assigned points and support overlay graphing of this data utilizing up to four (4) variables.

F. Alarm Processing:
1. Off normal condition: Cause alarm and appropriate message, including time, system, point descriptor, and alarm condition. Select alarm state/value and which alarms shall cause automatic dial-out.
2. Critical alarm or change-of-state: Display message, stored on disk for review and sort, or print.
3. Print on line changeable message, up to 100 characters in length, for each alarm point specified.
4. Display alarm reports on video. Display multiple alarms in order of occurrence.
5. Define time delay for equipment start-up or shutdown.
6. Allow unique routing of specific alarms.
7. Operator specifies if alarm requires acknowledgement.
8. Continue to indicate unacknowledged alarms after return to normal.
9. Alarm notification:
    a. Automatic print.
    b. Display indicating alarm condition.
    c. Selectable audible alarm indication.

G. Event Processing: Automatically initiate commands, user defined messages, take specific control actions or change control strategy and application programs resulting from event condition. Event condition may be value crossing operator defined limit, change-of-state, specified state, or alarm occurrence or return to normal.

H. Automatic Restart: Automatically restart field equipment on restoration of power. Provide time delay between individual equipment restart and time of day start/stop.

I. Messages:

1. Automatically display or print user-defined message subsequent to occurrence of selected events.
2. Compose, change, or delete any message.
3. Display or log any message at any time.
4. Assign any message to any event.

J. Reports:
1. Manually requested with time and date.
2. Long term data archiving to hard disk.
3. Automatic directives to download to transportable media such as floppy diskettes for storage.
4. Data selection methods to include data base search and manipulation.
5. Data extraction with mathematical manipulation.
6. Data reports shall allow development of XY curve plotting, tabular reports (both statistical and summary), and multi-point timed based plots with not less than four (4) variables displayed.
7. Generating reports either normally at operator direction, or automatically under work station direction.
8. Reports may either manually displayed or printed, or may be printed automatically on daily, weekly, monthly, yearly or scheduled basis.
9. Include capability for statistical data manipulation and extraction.
10. Provide capability to generate four types of reports: Statistical detail reports, summary reports, trend graphic plots, x-y graphic plots.

K. Parameter Save/Restore: Store most current operating system, parameter changes, and modifications on disk or diskette.

L. Data Collection:
1. Automatically collect and store in disk files.
2. Daily electrical energy consumption, peak demand, and time of peak demand for up to electrical meters over 2 year period.
3. Daily consumption for up to 30 meters over a 2 year period.
4. Daily billable electrical energy consumption and time for up to 1024 zones over a 10 year period.
5. Provide archiving of stored data for use with system supplied custom reports.

M. Graphic Display: Support graphic development on work station with software features:
1. Page linking.
2. Generate, store, and retrieve library symbols.
3. Single or double height characters.
4. Sixty (60) dynamic points of data per graphic page.
5. Pixel level resolution.
6. Animated graphics for discrete points.
7. Analog bar graphs.
8. Display real time value of each input or output line diagram fashion.

N. Maintenance Management:
1. Run time monitoring, per point.
2. Maintenance scheduling targets with automatic annunciation, scheduling and shutdown.
3. Equipment safety targets.
4. Display of maintenance material and estimated labor.
5. Target point reset, per point.

O. Advisories:
1. Summary which contains status of points in locked out condition.
2. Continuous operational or not operational report of interrogation of system hardware and programmable control units for failure.
3. Report of power failure detection, time and date.

4. Report of communication failure with operator device, field interface unit, point, programmable control unit.

2.10 LOAD CONTROL PROGRAMS

A. General: Support inch-pounds and SI (metric) units of measurement.

B. Demand Limiting:
1. Monitor total power consumption per power meter and shed associated loads automatically to reduce power consumption to an operator set maximum demand level.
2. Input: Pulse count from incoming power meter connected to pulse accumulator in control unit.
3. Forecast demand (kW): Predicted by sliding window method.
4. Automatically shed loads throughout the demand interval selecting loads with independently adjustable on and off time of between one and 255 minutes.
5. Demand Target: Minimum of 3 per demand meter; change targets based upon (1) time, (2) status of pre-selected points, or (3) temperature.
6. Load: Assign load shed priority, minimum "ON" time and maximum "OFF" time.
7. Limits: Include control band (upper and lower limits).
8. Output advisory if loads are not available to satisfy required shed amount, advise shed requirements and requiring operator acknowledgement.

C. Duty Cycling:
1. Periodically stop and start loads, based on space temperature, and according to various On/Off patterns.
2. Modify off portion of cycle based on operator specified comfort parameters. Maintain total cycle time by increasing on portion of cycle by same amount that off portion is reduced.
3. Set and modify following parameters for each individual load.
   a. Minimum and maximum Off time.
   b. On/Off time in one minute increments.
   c. Time period from beginning of interval until load can be cycled.
   d. Manually override the DCC program and place a load in an On or Off state.
   e. Cooling Target Temperature and Differential.
   f. Heating Target Temperature and Differential.
   g. Cycle off adjustment.

D. Automatic Time Scheduling:
1. Self-contained programs for automatic start/stop/scheduling of building loads.
2. Support up to seven (7) normal day schedules, seven (7) "special day" schedules and two (2) temporary day schedules.
3. Special days schedule shall support up to 30 unique date/duration combinations.
4. Any number of loads assigned to any time program; each load can have individual time program.
5. Each load assigned at least 16 control actions per day with 1 minute resolution.
6. Time schedule operations may be:
   a. Start.
   b. Optimized Start.
   c. Stop.
   d. Optimized Stop.
   e. Cycle.
   f. Optimized Cycle.
7. Minimum of 30 holiday periods up to 100 days in length may be specified for the year.
8. Create temporary schedules.
9. Broadcast temporary "special day" date and duration.

E. Start/Stop Time Optimization:
1. Perform optimized start/stop as function of outside conditions, inside conditions, or both.
2. Adaptive and self-tuning, adjusting to changing conditions unattended.
3. For each point under control, establish and modify:

a. Occupancy period.
b. Desired temperature at beginning of occupancy period.
c. Desired temperature at end of occupancy period.

F. Night Setback/Setup Program: Reduce heating space temperature setpoint or raise cooling space temperature setpoint during unoccupied hours; in conjunction with scheduled start/stop and optimum start/stop programs.

G. Calculated Points: Define calculations and totalization computed from monitored points (analog/digital points), constants, or other calculated points.
1. Employ arithmetic, algebraic, Boolean, and special function operations.
2. Treat calculated values like any other analog value, use for any function that a "hard wired point" might be used.

H. Event Initiated Programming: Event may be initiated by any data point, causing series of controls in a sequence.
1. Define time interval between each control action between 0 to 3600 seconds.
2. Output may be analog value.
3. Provide for "skip" logic.
4. Verify completion of one action before proceeding to next. If not verified, program shall be able to skip to next action.

I. Direct Digital Control: Each control unit shall provide Direct Digital Control software so that the operator may customize control strategies and sequences of operation by defining the appropriate control loop algorithms and choosing the optimum loop parameters.
1. Control loops: Defined using "modules" that are analogous to standard control devices.
2. Output: Paired or individual digital outputs for pulse-width modulation, and analog outputs, as required.
3. Firmware:
a. PID with analog or pulse-width modulation output.
b. Floating control with pulse-width modulated outputs.
c. Two-position control.
d. Primary and secondary reset schedule selector.
e. Hi/Lo signal selector.
f. Single pole double throw relay.
g. Single pole double throw time delay relay with delay before break, delay before make and interval time capabilities.
4. Direct Digital Control loops: Downloaded upon creation or on operator request. On sensor failure, program shall execute user defined failsafe output.
5. Display: Value or state of each of the lines which interconnect DDC modules.

J. Fine Tuning Direct Digital Control PID or floating loops:
1. Display information:
a. Control loop being tuned
b. Input (process) variable
c. Output (control) variable
d. Setpoint of loop
e. Proportional band
f. Integral (reset) Interval
g. Derivative (rate) Interval
2. Display format: Graphic, with automatic scaling; with input and output variable superimposed on graph of "time" vs "variable".

K. Trend logging:
1. Each control unit will store samples of control unit's data points.
2. Update file continuously at discretely assignable intervals.
3. Automatically initiate upload request and then store data on hard disk.
4. Time synchronize sampling at operator specified times and intervals with sample resolution of one minute.

5. Co-ordinate sampling with on/off state of specified point.
6. Display trend samples on work station in graphic format. Automatically scale trend graph with minimum 60 samples of data in plot of time vs data.

2.11 HVAC CONTROL PROGRAMS

A. General:
   1. Support Inch-pounds and SI (metric) units of measurement.
   2. Identify each HVAC Control system.

B. Optimal Run Time:
   1. Control start-up and shutdown times of HVAC equipment for both heating and cooling.
   2. Base on occupancy schedules, outside air temperature, seasonal requirements, and interior room mass temperature.
   3. Start-up systems by using outside air temperature, room mass temperatures, and adaptive model prediction for how long building takes to warm up or cool down under different conditions.
   4. Use outside air temperature to determine early shut down with ventilation override.
   5. Analyze multiple building mass sensors to determine seasonal mode and worse case condition for each day.
   6. Operator commands:
      a. Define term schedule
      b. Add/delete fan status point.
      c. Add/delete outside air temperature point.
      d. Add/delete mass temperature point.
      e. Define heating/cooling parameters.
      f. Define mass sensor heating/cooling parameters.
      g. Lock/unlock program.
      h. Request optimal run time control summary.
      i. Request optimal run time mass temperature summary.
      j. Request HVAC point summary.
      k. Request HVAC saving profile summary.
   7. Control Summary:
      a. HVAC Control system begin/end status.
      b. Optimal run time lock/unlock control status.
      c. Heating/cooling mode status.
      d. Optimal run time schedule.
      e. Start/Stop times.
      f. Selected mass temperature point ID.
      g. Optimal run time system normal start times.
      h. Occupancy and vacancy times.
      i. Optimal run time system heating/cooling mode parameters.
   8. Mass temperature summary:
      a. Mass temperature point type and ID.
      b. Desired and current mass temperature values.
      c. Calculated warm-up/cool-down time for each mass temperature.
      d. Heating/cooling season limits.
      e. Break point temperature for cooling mode analysis.
   9. HVAC point summary:
      a. Control system identifier and status.
      b. Point ID and status.
      c. Outside air temperature point ID and status.
      d. Mass temperature point ID and point.
      e. Calculated optimal start and stop times.
      f. Period start.

C. Supply Air Reset:

1. Monitor heating and cooling loads in building spaces, terminal reheat systems, both hot deck and cold deck temperatures on dual duct and multizone systems, single zone unit discharge temperatures.
2. Adjust discharge temperatures to most energy efficient levels satisfying measured load by:
   a. Raising cooling temperatures to highest possible value.
   b. Reducing heating temperatures to lowest possible level.
3. Operator commands:
   a. Add/delete fan status point.
   b. Lock/unlock program.
   c. Request HVAC point summary.
   d. Add/Delete discharge controller point.
   e. Define discharge controller parameters.
   f. Add/delete air flow rate.
   g. Define space load and load parameters.
   h. Request space load summary.
4. Control summary:
   a. HVAC control system status (begin/end).
   b. Supply air reset system status.
   c. Optimal run time system status.
   d. Heating and cooling loop.
   e. High/low limits.
   f. Deadband.
   g. Response timer.
   h. Reset times.
5. Space load summary:
   a. HVAC system status.
   b. Optimal run time status.
   c. Heating/cooling loop status.
   d. Space load point ID.
   e. Current space load point value.
   f. Control heat/cool limited.
   g. Gain factor.
   h. Calculated reset values.
   i. Fan status point ID and status.
   j. Control discharge temperature point ID and status.
   k. Space load point ID and status.
   l. Air flow rate point ID and status.

D. Enthalpy Switchover:
1. Calculate outside and return air enthalpy using measured temperature and relative humidity; determine energy expended and control outside and return air dampers.
2. Operator commands:
   a. Add/delete fan status point.
   b. Add/delete outside air temperature point.
   c. Add/delete discharge controller point.
   d. Define discharge controller parameters.
   e. Add/delete return air temperature point.
   f. Add/delete outside air dew point/humidity point.
   g. Add/delete return air dew point/humidity point.
   h. Add/delete damper switch.
   i. Add/delete minimum outside air.
   j. Add/delete atmospheric pressure.
   k. Add/delete heating override switch.
   l. Add/delete evaporative cooling switch.
   m. Add/delete air flow rate.

n. Define enthalpy deadband.
o. Lock/unlock program.
p. Request control summary.
q. Request HVAC point summary.

3. Control summary:
   a. HVAC control system begin/end status.
   b. Enthalpy switchover optimal system status.
   c. Optimal return time system status.
   d. Current outside air enthalpy.
   e. Calculated mixed air enthalpy.
   f. Calculated cooling cool enthalpy using outside air.
   g. Calculated cooling cool enthalpy using mixed air.
   h. Calculated enthalpy difference.
   i. Enthalpy switchover deadband.
   j. Status of damper mode switch.

2.12 PROGRAMMING APPLICATION FEATURES

A. Trend Point:
   1. Sample up to 150 points, real or computed, with each point capable of collecting 100 samples at intervals specified in minutes, hours, days, or month.
   2. Output trend logs as line graphs or bar graphs. Output graphic on terminal, with each point for line and bar graphs designated with a unique pattern, vertical scale either actual values or percent of range, and horizontal scale time base. Print trend logs up to 12 columns of one point/column.

B. Alarm Messages:
   1. Allow definition of minimum of 100 messages, each having minimum length of 100 characters for each individual message.
   2. Assign alarm messages to system messages including point's alarm condition, point's off-normal condition, totalized point's warning limit, hardware elements advisories.
   3. Output assigned alarm with "message requiring acknowledgement".
   4. Operator commands include define, modify, or delete; output summary listing current alarms and assignments; output summary defining assigned points.

C. Weekly Scheduling:
   1. Automatically initiate equipment or system commands, based on preselected time schedule for points specified.
   2. Provide program times for each day of week, per point, with one minute resolution.
   3. Automatically generate alarm output for points not responding to command.
   4. Provide for holidays, minimum of 366 consecutive holidays.
   5. Operator commands:
      a. System logs and summaries.
      b. Start of stop point.
      c. Lock or unlock control or alarm input.
      d. Add, delete, or modify analog limits and differentials.
      e. Adjust point operation position.
      f. Change point operational mode.
      g. Open or close point.
      h. Enable/disable, lock/unlock, or execute interlock sequence or computation profile.
      i. Begin or end point totalization.
      j. Modify totalization values and limits.
      k. Access or secure point.
      l. Begin or end HVAC or load control system.
      m. Modify load parameter.
      n. Modify demand limiting and duty cycle targets.

6. Output summary: Listing of programmed function points, associated program times, and respective day of week programmed points by software groups or time of day.

D. Interlocking:
   1. Permit events to occur, based on changing condition of one or more associated master points.
   2. Binary contact, high/low limit of analog point or computed point shall be capable of being utilized as master. Same master may monitor or command multiple slaves.
   3. Operator commands:
      a. Define single master/multiple master interlock process.
      b. Define logic interlock process.
      c. Lock/unlock program.
      d. Enable/disable interlock process.
      e. Execute terminate interlock process.
      f. Request interlock type summary.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

3.02 INSTALLATION

A. Install all Owner-provided equipment along with all contractor-provided equipment as required to provide a complete, fully functional building automation system.

B. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.

C. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 23 09 93.

D. Provide with 120v AC, 15 amp dedicated emergency power circuit to each programmable control unit.

E. Provide conduit and electrical wiring in accordance with Section 26 27 17. Electrical material and installation shall be in accordance with appropriate requirements of .

F. Ensure that all components necessary to execute the sequences of operation are coordinated and installed by all contractors.

3.03 MANUFACTURER'S FIELD SERVICES

A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

B. Provide service engineer to instruct Owner's representative in operation of systems plant and equipment for 2 day period.

C. Provide basic operator training for 4 persons on data display, alarm and status descriptors, requesting data, execution of commands and request of logs. Include a minimum of 8 hours dedicated instructor time. Provide training on site.

3.04 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate complete and operating system to Owner.

3.05 MAINTENANCE

A. Provide service and maintenance of energy management and control systems for two years from Date of Substantial Completion.

B. Provide four complete inspections, one in each season, to inspect, calibrate, and adjust controls as required, and submit written reports.

END OF SECTION

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SECTION 23 09 93

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

THE MECHANICAL CONTRACTOR SHALL PROVIDE ALL NECESSARY LABOR MATERIALS TO PROVIDE A FULLY FUNCTIONAL BUILDING AUTOMATION SYSTEM FOR THE PROJECT. THIS INCLUDES ALL CONTROL COMPONENTS, CONTROLLERS, WIRING, PROGRAMMING, AND COORDINATION BETWEEN TRADES TO ACCOMPLISH THE SEQUENCE OF OPERATIONS HEREIN. CONTRACTOR SHALL ENSURE THAT ALL COMPONENTS ARE COORDINATED BETWEEN EQUIPMENT SUPPLIERS AND CONTROLS VENDOR FOR ALL EQUIPMENT.

1.01 PART 1 GENERAL

1.02 SECTION INCLUDES

A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.

B. Sequence of operation for:
   1. Wall-Mounted Ductless Split Heat Pumps
   2. Direct Outside Air Supply Air Units with Energy Recovery Ventilators
   3. Exhaust Fans
   4. Kitchen Exhaust Hoods / Kitchen Make-Up Air Systems
   5. Variable Refrigerant Volume (VRF/VRV) Systems
   6. Cabinet heaters / Unit Heaters
   7. Electric Convectors and Radiators
   8. Packaged Rooftop Units
   9. Energy and Water Metering and Monitoring
   10. Site Lighting Control
   11. Customized Load Shedding Control
   12. Grease Trap Level Monitoring

1.03 RELATED SECTIONS

A. Section 23 09 23 - Direct-Digital Control System for HVAC.

B. Section 23 09 13 - Instrumentation and Control Devices for HVAC.

C. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.04 SYSTEM DESCRIPTION

A. This Section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other Sections.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
   1. Preface: 1 or 2 paragraph overview narrative of the system describing its purpose, components and function.
   2. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures; provide a complete description regardless of the completeness and clarity of the sequences specified in the contract documents.
   3. Include at least the following sequences:
      a. Start-up.
      b. Warm-up mode.
      c. Normal operating mode.
      d. Unoccupied mode.
      e. Shutdown.
      f. Capacity control sequences and equipment staging.

g. Temperature and pressure control, such as setbacks, setups, resets, etc.
h. Detailed sequences for all control strategies, such as economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
i. Effects of power or equipment failure with all standby component functions.
j. Sequences for all alarms and emergency shut downs.
k. Seasonal operational differences and recommendations.
l. Interactions and interlocks with other systems.

4. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
5. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.
6. Include schedules, if known.

C. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
1. Label with settings, adjustable range of control and limits.
2. Include flow diagrams for each control system, graphically depicting control logic.
3. Include the system and component layout of all equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
4. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.
5. Include all monitoring, control and virtual points specified in elsewhere.
6. Include a key to all abbreviations.

D. Points List: Submit list of all control points indicating at least the following for each point.
1. Name of controlled system.
2. Point abbreviation.
3. Point description; such as dry bulb temperature, airflow, etc.
4. Display unit.
5. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.
6. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.
7. Intermediate point (Yes / No); i.e. a point whose value is used to make a calculation which then controls equipment, such as space temperatures that are averaged to a virtual point to control reset.
8. Calculated point (Yes / No); i.e. a “virtual” point generated from calculations of other point values.

E. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

1.06 QUALITY ASSURANCE

A. Design system under direct supervision of a Professional Engineer experienced in design of this Work and licensed in the State in which the Project is located.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL SYSTEM DESIGN AND OPERATION STANDARDS

A. The BAS shall control the mechanical systems within the site based upon the following design parameters:

1. The large-group areas (gymnasium, cafeteria, etc.) shall be heated and cooled via packaged rooftop air-handling units utilizing integrated air-sourced heat pumps and supplemental natural gas-heating, direct-expansion cooling with hot-gas bypass and hot-gas reheat, and energy recovery sections. These units will control supply airflow, space temperature, discharge air temperature and local humidity.
2. The general occupied areas (including but not limited to offices, classrooms, corridors, conference rooms, group toilet rooms, etc.) shall be heated and cooled by a VRF heat-pump unit, with outdoor-air delivered via a dedicated energy-recovery ventilation unit. All units shall be controlled by the BAS. The units shall be controlled by a new DDC controller and DDC-based temperature sensors. This shall interface with the factory controller to provide full adjustment as indicated in the sequence below but shall not take the place of the factory controls and safeties governing the refrigeration systems. The local VRF unit controllers are to be mounted above the ceiling, at the unit.
3. Ancillary spaces will be heated by a combination of unit heaters or radiant heating as indicated on the drawings.

B. Each unit shall be controlled by an individual DDC Controller and all required sensors, control valves, and appurtenances required to complete the sequence of operation. Units shall include occupied/unoccupied control, night-setback, morning warm-up/cool-down, and enthalpy-based economizer functions.

C. The VRF heat-pump units shall also be controlled by the BAS. The units in public common areas (Corridors, restrooms, locker rooms, etc.) shall be controlled by a new DDC controller and DDC-based temperature sensors with no adjustment or display. This shall interface with the factory controller to provide full adjustment as indicated in the sequence below but shall not take the place of the factory controls and safeties governing the refrigeration systems.

D. Offices and classrooms shall be furnished with the standard manufacturer controller with occupant control limited to an adjustment of 2 degrees above or below the specified setpoint.

E. General Space Condition Alarm Parameters:
1. Space temperature too high = +4 degrees above setpoint for a duration of longer than 15 minutes (user adjustable)
2. Space temperature too low = -4 degrees below setpoint for a duration of longer than 15 minutes (user adjustable)
3. Space CO2 Level Too High = 1500 PPM for a duration of more than 15 minutes.

3.02 EXHAUST FANS

A. Exhaust Fans Serving Constant Exhaust Storage Rooms
1. Exhaust fans serving general storage spaces shall operate on an adjustable occupancy schedule.
2. Provide a motor operated damper on the fan. Damper to open when fan is engaged.
3. Exhaust Fan Monitoring:
   a. Provide a current sensor for each fan to show operational status on monitoring screen at the BAS terminal.

B. Exhaust Fans Serving Mechanical Rooms
1. Exhaust fans serving electrical rooms or mechanical equipment rooms shall be controlled by a line-voltage thermostat set to engage the fan when the temperature exceeds 85 degrees in the space (adjustable).
2. Provide a motor operated damper on the fan and associated supply-air louver. Dampers to open when fan is engaged.
3. Electrical Room Exhaust Fan Monitoring
   a. Provide a current sensor indicating operational status of the fan on the monitoring screen at the BAS terminal.
   b. Provide a status indicator for each MOD position on the monitoring screen at the BAS terminal via end switch.
   c. Provide temperature reading in each room on the monitoring screen at the BAS terminal.

d. Provide an alarm on the monitoring screen if the temperature exceeds 100 degrees (user adjustable).

C. Motor Operated Dampers Interlocked with Combustion Equipment
1. Where motor operated dampers are called to be interlocked with combustion equipment (water heaters, boilers, etc), the MOD shall open on command for equipment to fire. Provide an end switch to prove damper position. The MOD shall close upon de-energizing of the combustion cycle.

D. Exhaust Fans Serving Dishwashers
1. The exhaust fans serving each dishwasher shall be interlocked with associated dishwasher such that the fan is energized when the corresponding dishwasher is in operation and shall be de-energized when the dishwasher is not in use.
2. Provide a current sensor for each fan to show operational status.
3. Provide a motor operated damper on the fan. Damper is to open when fan is engaged.
4. The following items shall be displayed at the Operator's Terminal:
a. Commanded status of fan.
b. Operational status of fan via current sensor.
c. Position of associated motor operated dampers via end-switch.

3.03 KITCHEN EXHAUST HOODS / KITCHEN DEDICATED OUTDOOR AIR UNITS / KITCHEN MAKE-UP AIR UNITS

A. Exhaust fans serving Kitchen Range Hoods shall be controlled manually via a hood-mounted control system (see food service drawings).

B. Each exhaust fan and tempered make-up air unit shall be controlled via a variable-exhaust flow controller, as well as a BAS controller for integration into the building automation system. The controller shall independently vary the exhaust fan and supply air system via the corresponding variable frequency drives in response to the sensor reading in the hood exhaust for both temperature and particulate exhaust rate. A local controller shall be provided for BAS integration and control of the makeup air system.
1. The kitchen hood exhaust fan shall energize during cooking as commanded by the kitchen exhaust controller (see food service drawings)
a. When the kitchen hood exhaust fan is energized, the DOAS/MAU shall modulate to 100% fan speed, the return air damper shall modulate closed and the outside air damper shall modulate 100% open. The DOAS/MAU internal controls shall provide heating as required to provide neutral tempered makeup air to the space (68F° DAT, adj.)
2. When the kitchen hood exhaust fan is not energized and the building is in occupied mode (set at the BAS), the return damper on the DOAS or MAU shall modulate open and the outside air damper shall proportionally modulate closed to provide minimum outside air (10% unless noted on drawings).
a. The DOAS internal controls shall provide heating, cooling or dehumidification as required to satisfy the temperature and humidity setpoints in the space as sensed by the space temperature sensor/thermostat and humidistat.
b. The MAU internal controls shall provide heating as required to satisfy the temperature setpoints in the space as sensed by the space temperature sensor/thermostat.
3. When the kitchen hood exhaust fan is not energized and the building is in unoccupied mode (set at the BAS), the return damper on the DOAS or MAU shall modulate open 100% and the outside air damper shall modulate closed.
a. The DOAS internal controls shall provide heating, cooling or dehumidification as required to satisfy the temperature and humidity setpoints in the space as sensed by the space temperature sensor/thermostat and humidistat.
b. The MAU internal controls shall provide heating as required to satisfy the temperature setpoints in the space as sensed by the space temperature sensor/thermostat.

C. An offset of supply air / exhaust air shall be maintained such that supply airflow rate is always 90% of exhaust airflow rate.

D. See kitchen equipment plans for coordination and additional BAS requirements.

E. Provide a current sensor for each fan (supply and exhaust) to show operational status.

F. The following items shall be displayed at the Operator's Terminal:
   1. Operational status of fans via VFD feedback.
   2. Burner status of MAU/DOAS
   3. Discharge air temperature of makeup air unit and DOAS unit.
   4. Discharge humidity of DOAS unit.
   5. VFD power level for each fan (as a percentage)

3.04 POOL DEHUMIDIFCATION UNITS

A. The system shall be designed and sized to maintain the specified space conditions
   1. System Startup
      a. Power is turned on or the system is restarted
      b. After a short initial delay to allow the sensors to stabilize, the blower starts and operates continuously
      c. Based on sensor feedback, the system shall begin or resume operation based on the sequence below
   2. Airside Configuration
      a. The system continuously delivers the specified supply air volume to the natatorium
      b. The minimum exhaust air volume is set to meet the engineer's schedule.
      c. The minimum outdoor air volume is set to meet the engineer's schedule.
   3. Dehumidification Mode
      a. The return air relative humidity is above the humidity setpoint
      b. Return air dewpoint is above dewpoint setpoint.
      c. The compressor enters the Compressor Start sequence
      d. Initially, 100% of compressor hot gas discharge will be diverted to condense at the air reheat coil. The supply air temperature will be higher than the return air temperature
   4. Air Conditioning Mode
      a. The return air temperature is above the room temperature setpoint
      b. The compressor starts, if not already operating in Dehumidification Mode
      c. Excess compressor hot gas is diverted to the outdoor air cooled condenser for up to 100% heat rejection at summer design ambient conditions
   5. Space Heating Mode
      a. The return air temperature is below the room temperature setpoint
      b. The microprocessor space heating output signal (0-10 volts) is sent to the heating coil controller. The signal output will regulate based on the return air temperature
   6. Freeze Protection
      a. The supply air temperature falls below the freezestat setpoint
      b. Exhaust fan(s) are stopped and outdoor air damper(s) are fully closed
      c. When the freezestat alarm is tripped, it must be manually cleared by the operator

B. The following items shall be displayed at the Operator's Terminal:
   1. Commanded status of outdoor air dampers, temperature, and humidity
   2. Discharge air temperature and humidity setpoint.
   3. Discharge air temperature and humidity actual conditions.
   4. Operational status of each compressor.
   5. Factory error codes from each unit.
   6. VFD status
   7. Compressory status
   8. Heating status
   9. Economizer Status

3.05 ELECTRIC RADIATION AND CONVECTORS

A. The electric-resistance radiant and convective heating units shall be controlled by an individual DDC controller and space temperature sensor. Room temperature sensor maintains constant space temperature of 70 degrees F (adj.) by cycling heating element.
   1. Provide a current sensor indicating operational status of the heating unit on the monitoring screen at the BAS terminal.
   2. Provide stainless-steel flat-plate type temperature sensors with no setpoint adjustment.

B. For unoccupied spaces, control of each unit shall be controlled by a factory-provided thermostat. BAS system shall monitor temperature only.

C. The following items shall be displayed at the Operator's Terminal:
   1. Temperature Setpoint.
   2. Actual Space Temperature.
   3. Alarms.

3.06 SINGLE ZONE PACKAGED ROOFTOP UNITS WITH NATURAL GAS HEAT AND CENTRAL ENERGY RECOVERY

A. Each unit shall be controlled by an individual DDC Controller. The DDC Controller shall be wired to a space temperature sensor, space-level CO2 sensor, space humidity sensor, discharge air temperature sensor, return air temperature sensor, space differential pressure sensor, damper motors, and the contacts to the factory-mounted unit control system controlling the compressor(s), hot-gas bypass, hot-gas reheat, and gas train combustion equipment. See typical RTU controls schematic for additional I/O points.

B. Cooling Mode:
   1. During the programmed occupied mode, the supply fan shall run continuously with the outside air damper open to the minimum position (10% outdoor air unless otherwise shown on Schedule).
      a. The fan modulates to maintain space temperature while maintaining the discharge air setpoint (normally 55.0 deg. F - 60.0 deg. F). As the cooling load decreases, the fans will modulate down to minimum speed. As the space temperature continues to fall below the cooling setpoint by 1.0 deg. F (adj.) and remains at minimum speed for a period of time (default=10 minutes adj.) the fan will remain at minimum speed and enter into a discharge air reset mode. As the space temperature continues to drop toward the space occupied heating setpoint, the discharge air setpoint is reset between the “normal” discharge air cooling setpoint and the discharge air heating setpoint.
      b. The fan will remain at minimum speed until the space temperature exceeds the cooling setpoint +1.0 deg. F for 10 minutes (adj.). At that point it will revert to its fan modulating mode with its discharge setpoint equal to its Discharge Air Cooling setpoint.
      c. When in the occupied mode, the outdoor-air damper shall modulate to maintain the current outdoor airflow at setpoint as read by an outdoor airflow monitoring station. The BAS shall calculate and reset this outdoor airflow setpoint based on the current ventilation requirements based on field mounted CO2 sensor. The amount of outside air will be increased above the minimum setting on a rise in return air CO2 above the setpoint of 750 PPM (adjustable). On a return to setpoint the reverse occurs. Upon a rise in CO2 level above 1500 PPM, a high CO2 level will be displayed at the BAS workstation.
      d. Setpoints are adjustable at the BAS workstation. As the outdoor air damper and supply air fan adjusts, the return exhaust fan shall automatically adjust it's speed to maintain a constant static pressure within the space (0.3" WC, adjustable).
   2. On a rise in temperature above the programmed cooling setpoint, the unit shall energize the first compressor. The hot-gas bypass valve shall be modulated by the factory provided HGPB controls to provide part-load capacity. On a continued rise in space temperature,

the second compressor shall be energized. On a fall in temperature the compressor(s) shall de-energize in stages as they were energized.

3. The DX cooling shall stage and modulate to maintain the discharge air temperature setpoint in cooling mode. If economizing is enabled the outside air damper shall also modulate to maintain the discharge air temperature setpoint.
    a. As noted in paragraph B-1-a above, if cooling or heating is required and the fan is at minimum airflow then the DAT setpoint shall be reset up or down to accommodate space requirements.
4. For units equipped with an outdoor air economizer: The DDC Controller shall receive input from the Global Enthalpy Sensor. If the enthalpy of the outdoor air is lower than the defined minimum level (user adjustable) the mixing box economizer sequence shall be activated upon a call for cooling. The outside air damper shall never close past the minimum position during the occupied period.
5. When dehuminidifcation is required as sensed by the factory-provided humidistat (setpoint, 60% RH, adjustable), the hot-gas reheat system will be engaged and follow the factory-programmed sequence.

C. Heating Mode:
1. During the programmed occupied mode, the supply fan shall run continuously with the outside air damper open to the minimum position (10% outdoor air unless otherwise shown on Schedule).
    a. The supply fan shall modulate airflow to maintain space temperature. The supply fan shall not modulate below the minimum OA ventilation rate required in the space. If cooling or heating is required and the fan is at minimum airflow then the DAT setpoint shall be reset up or down to accommodate space requirements. When the space temperature decreases to 1.0 deg. F below the heating setpoint, the fan will ramp up to 100% and the heat will be enabled. When the space temperature exceeds the heating setpoint +1.0 deg. F the heat will be disabled and the fan will ramp down to its minimum speed. Reset of the discharge air setpoint will occur every 5-10 minutes (adj.)
    b. When the space temperature rises above the occupied cooling setpoint the mode shall transition to cooling. When the space temperature falls below the occupied heating setpoint the mode shall transition to heating. When the space temperature is above the occupied cooling setpoint or below the occupied heating setpoint the mode shall remain in its last state. If the space temperature sensor fails the mode shall remain in its last state and an alarm shall be annunciated at the BAS. If the local and communicated setpoints fail the controller shall disable the supply fan and an alarm shall be annunciated at the BAS.
    c. When in the occupied mode, the outdoor-air damper shall modulate to maintain the current outdoor airflow at setpoint. The BAS shall calculate and reset this outdoor airflow setpoint based on the current ventilation requirements based on field mounted CO2 sensor. The amount of outside air will be increased above the minimum setting on a rise in return air CO2 above the setpoint of 750 PPM (adjustable). On a return to setpoint the reverse occurs. Upon a rise in CO2 level above 1500 PPM, a high CO2 level will be displayed at the BAS workstation.
    d. Setpoints are adjustable at the BAS workstation. As the outdoor air damper and supply air fan adjusts, the return exhaust fan shall automatically adjust it's speed to maintain a constant static pressure within the space (0.3" WC, adjustable).
2. When a call for heating is received, the reversing valve for the compressor system shall be energized to provide heating to the space. The compressors shall modulate as necessary to maintain the programmed discharge air temperature (90 deg F, adjustable). The compressors shall deenergize once the space temperature setpoint is met.
3. Once the temperature has fallen below 35 deg. F (adjustable), the gas-fired heating section shall modulate to maintain the discharge air temperature setpoint as defined on the unit schedule. Temperatures shall be user-adjustable. As noted in paragraph C-1-a above, If cooling or heating is required and the fan is at minimum airflow then the DAT setpoint shall be reset up or down to accommodate space requirements.

D. Energy Recovery Wheel Operation
   1. FOR UNITS EQUIPPED WITH AN ENERGY RECOVERY WHEEL: The AHU shall be in cooling recovery mode when the outdoor air temperature is greater than the space temperature and higher than the energy wheel enable setpoint (system economizer setpoint temperature). When the wheel is enabled, both outdoor & exhaust air bypass dampers shall be closed, outdoor air damper shall be at minimum, return air damper shall be open, and cooling shall be enabled. In cooling the recovery wheel shall be disabled when the outdoor air temperature is less than the space temperature and both outdoor & exhaust air bypass dampers shall be open.
   2. The AHU shall be in heating recovery mode when the outdoor air temperature is less than the space temperature and less than the energy wheel enable setpoint and the supply air temperature is less than the discharge air setpoint. When heat recovery is enabled the wheel shall be enabled as the first stage of heat, the outdoor air damper shall be at minimum, the outdoor & bypass recovery bypass dampers shall be open, and the unit heat shall be disabled. On a continued call for heat the second stage is enabled, the outdoor recovery bypass damper shall close, and the exhaust recovery bypass damper shall modulate to maintain the space temperature setpoint. If additional heat is required the third stage is enabled, the return air damper shall be open, both recovery bypass dampers shall be closed, and the unit heat shall be enabled.
   3. If the outdoor air temperature drops below the outdoor air frost protection setpoint (adj.), the outdoor air bypass damper shall modulate to maintain the exhaust-side leaving temperature at setpoint. If the outdoor air bypass damper reaches 100% open for 5 minutes (adj.), the wheel shall be turned off to prevent frosting and an alarm shall be annunciated.

E. Cafeteria / Common Area Unit Pressurization
   1. For the unit serving the cafeteria, provide a space-level differential air pressure sensor between the cafeteria and kitchen areas. Unit to maintain a constant 0.05" W.C. positive pressure from the cafeteria to the kitchen by varying the variable frequency drive on the exhaust fan in the cafeteria / common area unit.

F. Dehumidification mode: On a rise in humidity levels as determined by space humidity sensors the following shall occur. The cooling and HGRH coils shall modulate capacity to satisfy the space-mounted humidity sensor. On a continued rise in space humidity the BAS shall de-energize the ERV and close outside air dampers. On a decrease in space humidity, the reverse shall occur. The cooling sequence shall take precedence and dehumidification sequence shall be separately engaged once cooling is satisfied.

G. Unoccupied Mode:
   1. During the programmed un-occupied mode, the supply fan, compressor, gas train, and dampers for shall be cycled / modulated to maintain the un-occupied setpoints (55 degrees in Heating mode, 80 degrees in Cooling mode, both adjustable). Unless required for economizer cycle, the outside air damper shall remain closed.

H. All setpoints and shall be adjustable at the BAS workstation.

I. Provide a current sensor on one phase of power feeding each supply fan, exhaust fan, heat wheel, and compressor for status indication at the Operator's Terminal.

J. If the discharge temperature fails to rise to a programmed minimum temperature during a call for heating; a low temperature alarm shall be activated at the Operator's Terminal. If the discharge temperature fails to fall to a programmed minimum temperature on a call for mechanical cooling, a high temperature alarm shall be activated at the Operator's Terminal.

K. Duct smoke detectors shall be provided in supply and return ductwork, with connection to the fire alarm control panel and associated rooftop unit for fan shutdown.

L. The following items shall be displayed at the Operator's Terminal:
   1. Space temperature.
   2. Space temperature setpoint.

3. Space humidity.
4. Space humidity setpoint.
5. Low Space temperature alarm.
6. High Space temperature alarm.
7. Discharge air temperature.
8. Discharge air temperature setpoint.
9. Return air temperature.
10. Outside air temperature, humidity and enthalpy.
11. Economizer enthalpy setpoint.
12. Space CO2 level.
13. Space CO2 level setpoint.
14. Space high CO2 level alarm: “1500 PPM”, adjustable.
15. Supply fan operational status and speed (percentage)
16. Commanded status of supply fan. Alarm if commanded and operation status differs.
17. Exhaust fan operational status and speed (percentage)
18. Commanded status of exhaust fan. Alarm if commanded and operation status differs.
19. Heat Wheel operational status via current sensor. Alarm if commanded and operation status differs.
20. Commanded status of heat wheel. Alarm if commanded and operation status differs.
21. Commanded status of compressor(s). Alarm if commanded and operation status differs.
22. Commanded status of gas-train.
23. Commanded position of dampers.
24. Diagram showing the layout of the unit with major components and dynamic temperatures shown where temperature sensors exist in the system.

3.07 ELECTRIC UNIT HEATERS AND ELECTRIC CABINET HEATERS

A. Electric Cabinet Heaters: DDC controller set at 70 degrees F (adjustable) maintains constant space temperature by cycling unit fan motor and electric heating element. Provide stainless-steel flat-plate type temperature sensors with no setpoint adjustment.

B. Electric Unit Heaters: User-adjustable line voltage thermostat maintains constant space temperature by cycling unit fan motor and electric heating element.

C. The following items shall be displayed at the Operator's Terminal:
   1. Temperature Setpoint.
   2. Actual space temperature.
   3. Commanded status of gas train.
   4. Commanded status of fan motor.

3.08 DUCTLESS SPLIT HEAT PUMPS

A. The split system shall have a BAS DDC interface wired to the manufacturer factory central system controller to provide operation, configuration, and monitoring of the system. The manufacturer factory controller shall operate in BACnet protocol, and be connected to the space temperature sensors as specified.

B. For unoccupied spaces, control of each unit shall be controlled by a factory-provided thermostat. BAS system shall monitor temperature only.

C. Sequence of operation:
   1. Cooling Mode: The supply fan and compressor shall engage as needed to maintain setpoint (75 deg, adj.).
   2. Heating Mode: The supply fan, compressor, and reversing valve shall engage as needed to maintain setpoint (70 deg. F, adj.).
   3. The following items shall be accessible and displayed at the Operator's Terminal:
      a. Space temperature setpoint at each fan-coil unit (user adjustable).
      b. Actual space temperature of each fan-coil unit.
      c. Operational status of each fan-coil unit (heating, cooling, off, user adjustable).
      d. Factory error codes from each unit.

e. Remote space temperature sensor override for each fan-coil unit (user adjustable to limit temperature adjustment range, heat/cool selection, fan speed).
f. Compressor status.
g. Accumulated power consumption.

D. The space shall also be provided with a BAS supplied space temperature sensor that shall trigger an alarm if the space temperature in the MDF or IDF room rises above a designated setpoint (85 degrees, adjustable).

3.09 VARIABLE REFRIGERANT VOLUME HEAT PUMP SYSTEMS

A. The variable refrigerant split system shall have a BAS DDC interface wired to the manufacturer factory central system controller to provide operation, configuration, and monitoring of the system. The manufacturer factory central controller shall operate in BACnet protocol, and be connected to manufacturer factory space temperature sensors as specified.

B. Sequence of operation:
1. Cooling Mode: During the programmed occupied mode, the supply fan shall run continuously. On a rise in space temperature above the setpoint (74 degrees, adjustable), the manufacturer central controller shall energize the central compressor to provide cooling. The internal capacity control valve in the evaporator unit shall modulate to control the flow of refrigerant to maintain space temperature. On a fall in space temperature the refrigerant capacity control valve shall modulate closed.
2. Heating Mode: During the programmed occupied mode, the supply fan shall run continuously. On a drop in space temperature below the setpoint (70 degrees, adjustable), the manufacturer central controller shall energize the central compressor to with the requisite reversing valve to provide heating to the evaporator unit as required. The internal capacity control valve in the evaporator unit shall modulate to control the flow of refrigerant to maintain space temperature. On a fall in space temperature the refrigerant capacity control valve shall modulate closed.
3. The following items shall be accessible and displayed at the Operator's Terminal:
a. Space temperature setpoint at each fan-coil unit (user adjustable).
b. Actual space temperature of each fan-coil unit space.
c. Operational status of each fan-coil unit (heating, cooling, off, fan speed).
d. Factory error codes from each unit.
e. Remote space temperature sensor override for each fan-coil unit (user adjustable to limit temperature adjustment range, heat/cool selection, fan speed).
f. Compressor Status
g. Refrigerant monitor alarm status
4. Unoccupied Mode: During the programmed un-occupied mode, the supply fan, compressors, and thermal expansion valves shall be cycled / modulated to maintain the un-occupied setpoints (55 degrees in Heating mode, 80 degrees in Cooling mode, both adjustable).
5. In the event of a refrigerant monitor alarm, the local terminal unit shall sound an alarm and immediately shut down while simulataneously closing the isolation solenoid valves assocaited with the space. The alarm shall be send to the BAS for notification to all parties identified.

C. Each terminal unit (fan coil) shall be controlled by the factory-provided wall-mounted controller. Each office or classroom space shall be allowed a temperature control variation of +2 degrees F or -2 degrees F from the designated setpoints noted above.

D. Where multiple units serve the same zone, a factory-supplied control twinning kit will be provided to allow for a single temperature sensor to control both zones.

E. For all public corridors, locker rooms, restrooms, and vestibules, provide stainless-steel flat-plate type temperature sensors with no setpoint adjustment.

3.10 ENERGY RECOVERY DEDICATED OUTDOOR AIR SYSTEMS (DOAS) FOR VRF SYSTEM

A. Supply air units shall be scheduled for occupied and unoccupied cycles based on an operator adjustable time schedule. Units may also be manually enabled and disabled at the operator workstation. Fan status shall be monitored by the BAS via the fans current sensing relay.

B. The variable frequency drives shall be set by the balancer to deliver the minimum outdoor air to each associated terminal unit under fully-occupied conditions.

C. When the building is in occupied mode the unit shall be energized.
   1. The unit exhaust and outside air isolation dampers shall open.
   2. Provide proof of airflow for each fan and provide fan failure alarms.
   3. Provide temperature indication of the supply and exhaust inlet and leaving air.
   4. Duct smoke detectors shall be provided in supply and return ductwork with connection to fire alarm control panel and associated DOAS for fan shutdown.
   5. The refrigeration compressor system, hot gas reheat system, and electric resistance heating section shall be energized as required to maintain the target discharge air (supply air) temperature of heating and cooling modes to the units (55 °F heating, 72 °F cooling @ 50% RH, User Adjustable.

D. The following items shall be displayed at the operators workstation:
   1. Discharge temperature downstream of the DOAS.
   2. Return air temperature.
   3. Outside air temperature, humidity and enthalpy.
   4. Fan operational status via current sensor. Alarm if commanded and operation status differs.
   5. Commanded status of fan. Alarm if commanded and operation status differs.
   6. Commanded status of heating coils (as applicable). Alarm if commanded and operation status differs.
   7. Commanded status of refrigeration systems.
   8. Commanded position of dampers.
   9. Diagram showing the layout of the unit with major components and dynamic temperatures shown where temperature sensors exist in the system.

3.11 ENERGY AND WATER METERING

A. The incoming electrical feeds and water feeds for the building will be provided with meters for monitoring of utility usage.
   1. Electrical Monitoring: BAS system shall receive input from a factory-provided power meter integrated into the main switchgear for the facility.
      a. Monitor and trend:
         1) Energy usage
         2) Power demand
         3) Reactive Power (KVAR)
         4) Phase loss
         5) Any error codes/failures from the meter system.
      b. Alarms:
         1) Power failure. Send alarm to end-user as specified by Owner.
   2. Water monitoring: BAS system shall receive a pulse-output signal from the contractor-provided meter.
      a. Monitor and trend:
         1) Total water usage
         2) Daily water usage
         3) Daily average (7 day time window, user adjustable)
      b. Alarms:
         1) Breech of daily average trend by more than 50%. Send alarm to end-user as specified by Owner.

3.12 CUSTOMIZED LOAD SHEDDING CONTROL:

A. The system shall provide a customizable, single-point control on the home screen that will allow the Owner to shed power load from the facility. Load shedding shall be achieved as follows:
   1. Global Cooling Setpoint Reset - Reset all space temperature setpoints to their night-setback temperatures. This shall not put the building into night setback mode, as ventilation units must continue to operate during this time.
      a. NOTE: The Nurse's Suite shall be exempt from this reset option.

3.13 GREASE TRAP LEVEL MONITORING

A. The level of grease buildup within the grease trap shall be monitored by the BAS.
   1. Water monitoring: BAS system shall receive output signal from the contractor-provided level indicator.
      a. Monitor and trend:
         1) Daily level
      b. Alarms:
         1) High level alarm from the contractor-provided level indicator.

END OF SECTION

SECTION 23 21 13
HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Equipment Drains and Overflows

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 08 31 00 - Access Doors and Panels.

C. Section 09 90 00 - Painting and Coating.

D. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

E. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

F. Section 22 07 19 - Plumbing Piping Insulation.

G. Section 22 0516 - Expansion Fittings and Loops for Plumbing Piping.

H. Section 23 05 16 - Expansion Fittings and Loops for HVAC Piping.

I. Section 23 05 48 - Vibration and Seismic Con. for Equipment.

J. Section 23 05 53 - Identification for HVAC Piping and Equipment.

K. Section 23 07 19 - HVAC Piping Insulation.

L. Section 23 21 14 - Hydronic Specialties.

M. Section 23 25 00 - HVAC Water Treatment: Pipe cleaning.

N. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fuzing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.

B. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998 (R2006).

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2018.

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.

E. ASME B31.9 - Building Services Piping; 2017.

F. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005).

G. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; The American Society of Mechanical Engineers; 2006.

H. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2008 (ANSI/ASME B31.9).

I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

J. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2019.

K. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

L. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2020.

M. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

N. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015, with Editorial Revision (2018).

O. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings; 2004 (Reapproved 2016).

P. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2020.

Q. ASTM D2310 - Standard Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe; 2006 (Reapproved 2012).

R. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2017.

S. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; 2020.

T. ASTM D2680 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping; 2001 (Reapproved 2014).

U. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings; 2005.

V. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020.

W. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).

X. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing; 2020.

Y. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems; 2007.

Z. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; 2004 and errata.

AA. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

AB. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; American Water Works Association; 2005 (ANSI/AWWA C105/A21.5).

AC. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2012.

AD. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017, with Errata (2018).

AE. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.

1.04 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASME B31.9 unless indicated otherwise.

1.05 SUBMITTALS

A. Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

B. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

C. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with minimum three years of experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 code for installation of piping system.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.09 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), drawn; using one of the following joint types:
   1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
   2. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
   3. Joints: Solder, lead free, ASTM B 32, HB alloy (95-5 tin-antimony), or tin and silver.

B. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.
   1. Fittings: ASTM D2466 or D2467, PVC.
   2. Joints: Solvent welded in accordance with ASTM D2855.

2.02 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

B. Conform to ASME B31.9.

C. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.

D. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

E. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.

F. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.

G. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

H. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.

I. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

J. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

K. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.

L. Vertical Support: Steel riser clamp.

M. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

N. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

O. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

P. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

Q. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

R. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

S. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment using jointing system specified.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.02 INSTALLATION

A. All condensate installed above inaccessible ceilings, behind walls, or exterior to building shall be provided as copper.

B. Install in accordance with manufacturer's instructions.

C. Install heating water, chilled water, dual-temperature, and condenser water piping to ASME B31.9 requirements.

D. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

E. Route piping in orderly manner, parallel to building structure, and maintain gradient.

F. Install piping to conserve building space and to avoid interfere with use of space.

G. Group piping whenever practical at common elevations.

H. Sleeve pipe passing through partitions, walls and floors.

I. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

J. Slope piping and arrange to drain at low points.

K. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 05 16.
   1. Flexible couplings may be used in header piping to accommodate thermal growth, thermal contraction in lieu of expansion loops.

L. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

M. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as scheduled.

3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.
9. Prime coat exposed steel hangers and supports. Refer to Section 09 90 00. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

N. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 19.

O. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 23 07 19.

P. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 31 00.

Q. Use eccentric reducers to maintain top of pipe level.

R. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

S. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting. Refer to Section 09 90 00.

T. Install valves with stems upright or horizontal, not inverted.

3.03 SCHEDULES

A. Hanger Spacing for Copper Tubing.
1. 1/2 inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. 1 inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. 1-1/2 inch and 2 inch: Maximum span, 8 feet; minimum rod size, 3/8 inch.
4. 2-1/2 inch: Maximum span, 9 feet; minimum rod size, 3/8 inch.
5. 3 inch: Maximum span, 10 feet; minimum rod size, 3/8 inch.
6. 4 inch: Maximum span, 12 feet; minimum rod size, 1/2 inch.
7. 6 inch: Maximum span, 14 feet; minimum rod size, 1/2 inch.
8. 8 inch: Maximum span, 16 feet; minimum rod size, 5/8 inch.
9. 10 inch: Maximum span, 18 feet; minimum rod size, 3/4 inch.
10. 12 inch: Maximum span, 19 feet; minimum rod size, 7/8 inch.

B. Hanger Spacing for Steel Piping.
1. 1/2 inch, 3/4 inch, and 1 inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
2. 1-1/4 inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
3. 1-1/2 inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. 2 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. 2-1/2 inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
6. 3 inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.
7. 4 inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.
8. 6 inches: Maximum span, 17 feet; minimum rod size, 1/2 inch.
9. 8 inches: Maximum span, 19 feet; minimum rod size, 5/8 inch.
10. 10 inches: Maximum span, 20 feet; minimum rod size, 3/4 inch.
11. 12 inches: Maximum span, 23 feet; minimum rod size, 7/8 inch.
12. 14 inches: Maximum span, 25 feet; minimum rod size, 1 inch.
13. 16 inches: Maximum span, 27 feet; minimum rod size, 1 inch.

14. 18 inches: Maximum span, 28 feet; minimum rod size, 1-1/4 inch.
15. 20 inches: Maximum span, 30 feet; minimum rod size, 1-1/4 inch.

C. Hanger Spacing for Plastic Piping.
1. 1/2 inch: Maximum span, 42 inches; minimum rod size, 1/4 inch.
2. 3/4 inch: Maximum span, 45 inches; minimum rod size, 1/4 inch.
3. 1 inch: Maximum span, 51 inches; minimum rod size, 1/4 inch.
4. 1-1/4 inches: Maximum span, 57 inches; minimum rod size, 3/8 inch.
5. 1-1/2 inches: Maximum span, 63 inches; minimum rod size, 3/8 inch.
6. 2 inches: Maximum span, 69 inches; minimum rod size, 3/8 inch.
7. 3 inches: Maximum span, 7 feet; minimum rod size, 3/8 inch.
8. 4 inches: Maximum span, 8 feet; minimum rod size, 1/2 inch.
9. 6 inches: Maximum span, 10 feet; minimum rod size, 1/2 inch.
10. 8 inches: Maximum span, 11 feet; minimum rod size, 5/8 inch.
11. 10 inches: Maximum span, 13 feet; minimum rod size, 3/4 inch.
12. 12 inches: Maximum span, 14 feet; minimum rod size, 7/8 inch.
13. 14 inches: Maximum span, 15 feet; minimum rod size, 1 inch.
14. 16 inches: Maximum span, 16 feet; minimum rod size, 1 inch.
15. 18 inches: Maximum span, 18 feet; minimum rod size, 1-1/4 inch.

END OF SECTION

SECTION 23 23 00
REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping.
B. Refrigerant.
C. Moisture and liquid indicators.
D. Valves.
E. Strainers.
F. Check valves.
G. Pressure relief valves.
H. Filter-driers.
I. Solenoid valves.
J. Expansion valves.
K. Receivers.
L. Flexible connections.

1.02 RELATED REQUIREMENTS

A. Section 08 31 00 - Access Doors and Panels.
B. Section 09 90 00 - Painting and Coating.
C. Section 22 07 19 - Plumbing Piping Insulation.
D. Section 22 07 16 - Plumbing Equipment Insulation.
E. Section 23 54 00 - Furnaces.
F. Section 23 61 00 - Refrigerant Compressors.
G. Section 23 62 13 - Packaged Air-Cooled Refrigerant Compressor and Condenser Units.
H. Section 23 63 13 - Air Cooled Refrigerant Condensers.
I. Section 23 81 24 - Computer Room Air Conditioners - Floor Mounted.
J. Section 23 82 16 - Air Coils.
K. Section 23 09 93 - Sequence of Operations for HVAC Controls.
L. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. AHRI 495 - Performance Rating of Refrigerant Liquid Receivers; 2005.
B. AHRI 710 - Performance Rating of Liquid-Line Driers; 2009.
C. AHRI 730 (I-P) - Flow Capacity Rating of Suction-Line Filters and Suction-Line Filter-Driers; 2013.
D. AHRI 750 - Thermostatic Refrigerant Expansion Valves; 2007.
E. AHRI 760 - Performance Rating of Solenoid Valves for Use With Volatile Refrigerants; 2007.
F. ASHRAE Std 15 - Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants ; 2019.
G. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2019.
H. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2019.

I. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fuzing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications; 2019.

J. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.

K. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.

L. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2020.

M. ASME B31.9 - Building Services Piping; 2017.

N. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

O. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2019.

P. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2020.

Q. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

R. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2020.

S. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).

T. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011 (Amended 2012).

U. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

V. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.

W. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.

X. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.

Y. UL 429 - Electrically Operated Valves; Current Edition, Including All Revisions.

1.04 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with MSS SP-69 unless indicated otherwise.

C. Liquid Indicators:
   1. Use line size liquid indicators in main liquid line leaving condenser.
   2. If receiver is provided, install in liquid line leaving receiver.
   3. Use line size on leaving side of liquid solenoid valves.

D. Valves:
   1. Use service valves on suction and discharge of compressors.
   2. Use gage taps at compressor inlet and outlet.
   3. Use gage taps at hot gas bypass regulators, inlet and outlet.
   4. Use check valves on compressor discharge.
   5. Use check valves on condenser liquid lines on multiple condenser systems.

E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.

F. Strainers:
   1. Use line size strainer upstream of each automatic valve.

2. Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.
3. On steel piping systems, use strainer in suction line.
4. Use shut-off valve on each side of strainer.

G. Pressure Relief Valves: Use on ASME receivers and pipe to outdoors.

H. Filter-Driers:
1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
2. Use a filter-drier on suction line just ahead of compressor.
3. Use sealed filter-driers in lines smaller than 1/2 inch outside diameter.
4. Use sealed filter-driers in low temperature systems.
5. Use sealed filter-driers in systems utilizing hermetic compressors.
6. Use replaceable core filter-driers in lines of 1/2 inch outside diameter or greater.
7. Use replaceable core liquid-line filter-driers in systems utilizing receivers.
8. Use filter-driers for each solenoid valve.

I. Solenoid Valves:
1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.
2. Use in liquid line of single or multiple evaporator systems.
3. Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

J. Receivers:
1. Use on systems five tons and larger, sized to accommodate pump down charge.
2. Use on systems with long piping runs.

K. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.05 SUBMITTALS

A. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

B. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.

C. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

D. Test Reports: Indicate results of leak test, acid test.

E. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

F. Submit welders certification of compliance with ASME (BPV IX) or AWS D1.1.

G. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.

H. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum five years of documented experience.

B. Design piping system under direct supervision of a Professional Engineer experienced in design of this type of work.

C. Design piping system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.07 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 for installation of piping system.

B. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

C. Welders Certification: In accordance with ASME (BPV IX) or AWS D1.1.

D. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

1.09 MAINTENANCE PRODUCTS

A. See Section 01 6000 - Product Requirements, for additional provisions.

B. Provide two refrigeration oil test kits each containing everything required to conduct one test.

C. Provide two filter-dryer cartridges of each type.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Filter-Driers:
   1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

2.02 REGULATORY REQUIREMENTS

2.03 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn .
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy.

B. Copper Tube to 7/8 inch OD: ASTM B88 (ASTM B88M), Type K (A), annealed.
   1. Fittings: ASME B16.26 cast copper.
   2. Joints: Flared.

C. Pipe Supports and Anchors:
   1. Conform to ASTM F 708, MSS SP-58, MSS SP-69, and MSS SP-89.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Carbon steel adjustable swivel, split ring.
   3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
   7. Vertical Support: Steel riser clamp.
   8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
   10. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
   11. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.04 REFRIGERANT

A. Refrigerant: See Schedules

2.05 MOISTURE AND LIQUID INDICATORS

A. Manufacturers:
   1. Henry Technologies: www.henrytech.com/#sle.
   2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com/#sle.
   3. Sporlan Valve Company: www.sporlan.com/#sle.

B. Indicators: Single or Doubleport type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.06 VALVES

A. Manufacturers:
   1. Hansen Technologies Corporation: www.hantech.com/#sle.
   2. Henry Technologies: www.henrytech.com/#sle.
   3. Danfoss Flomatic: www.flomatic.com/#sle.

B. Diaphragm Packless Valves:
   1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

C. Packed Angle Valves:
   1. Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, solder or flared ends; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

D. Ball Valves:
   1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.

E. Service Valves:
   1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi.

2.07 STRAINERS

A. Straight Line or Angle Line Type:
   1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

B. Straight Line, Non-Cleanable Type:
   1. Steel shell, copper plated fittings, stainless steel wire screen, for maximum working pressure of 500 psi.

2.08 CHECK VALVES

A. Manufacturers:
   1. Hansen Technologies Corporation: www.hantech.com/#sle.
   2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com/#sle.
   3. Sporlan Valve Company: www.sporlan.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Globe Type:

1. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc; for maximum temperature of 300 degrees F and maximum working pressure of 500 psi.

C. Straight Through Type:
1. Brass body and disc, phosphor-bronze or stainless steel spring, neoprene seat; for maximum working pressure of 500 psi and maximum temperature of 200 degrees F.

2.09 PRESSURE REGULATORS

A. Manufacturers:
1. Hansen Technologies Corporation: www.hantech.com/#sle.
2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com/#sle.
3. Sporlan Valve Company: www.sporlan.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Brass body, stainless steel diaphragm, direct acting, adjustable over 0 to 80 psi range, for maximum working pressure of 450 psi.

2.10 PRESSURE RELIEF VALVES

A. Manufacturers:
1. Hansen Technologies Corporation: www.hantech.com/#sle.
2. Henry Technologies: www.henrytech.com/#sle.
3. Sherwood Valve/Harsco Corporation: www.sherwoodvalve.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Straight Through or Angle Type: Brass body and disc, neoprene seat, factory sealed and stamped with ASME UV and National Board Certification NB, selected to ASHRAE Std 15, with standard setting of 425 psi, adjusted to meet system requirements.

2.11 FILTER-DRIERS

A. Manufacturers:
1. Flow Controls Division of Emerson Electric: www.emersonflowcontrols.com/#sle.
2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com/#sle.
3. Sporlan Valve Company: www.sporlan.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Performance:
1. Flow Capacity - Liquid Line: As indicated in schedule, minimum, rated in accordance with AHRI 710.
2. Flow Capacity - Suction Line: As indicated in schedule, minimum, rated in accordance with AHRI 730 (I-P).
3. Water Capacity: As indicated in schedule, rated in accordance with AHRI 710.
4. Pressure Drop: 2 psi, As indicated in schedule, maximum, when operating at full connected evaporator capacity.
5. Design Working Pressure: As indicated in schedule or 350 psi, minimum.

C. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns; of construction that will not pass into refrigerant lines.

D. Construction: UL listed.
1. Replaceable Core Type: Steel shell with removable cap.
2. Sealed Type: Copper shell.
3. Connections: As specified for applicable pipe type.

2.12 SOLENOID VALVES

A. Manufacturers:
1. Flow Controls Division of Emerson Electric: www.emersonflowcontrols.com/#sle.
2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com/#sle.
3. Sporlan Valve Company: www.sporlan.com/#sle.

B. Valve: AHRI 760, pilot operated, copper or brass body and internal parts, synthetic seat, stainless steel stem and plunger assembly (permitting manual operation in case of coil failure), integral strainer, with flared, solder, or threaded ends; for maximum working pressure of 500 psi.

C. Coil Assembly: UL 429, UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box with pilot light.

D. Electrical Characteristics: per drawings.

2.13 EXPANSION VALVES

A. Manufacturers:
1. Flow Controls Division of Emerson Electric: www.emersonflowcontrols.com/#sle.
2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com/#sle.
3. Sporlan Valve Company: www.sporlan.com/#sle.

B. Angle or Straight Through Type: AHRI 750; design suitable for refrigerant, brass body, internal or external equalizer, mechanical pressure limit (maximum operating pressure MOP feature), adjustable superheat setting, replaceable inlet strainer, with replaceable capillary tube and remote sensing bulb and remote bulb well.

C. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10 degrees F superheat. Select to avoid being undersized at full load and excessively oversized at part load.

2.14 ELECTRONIC EXPANSION VALVES

A. Manufacturers:
1. Danfoss Automatic Controls: www.danfoss.com.
2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com/#sle.
3. Sporlan Valve Company: www.sporlan.com/#sle.

B. Valve:
1. Brass body with flared or solder connection, needle valve with floating needle and machined seat, stepper motor drive.
2. Capacity: per drawings.
3. Electrical Characteristics: per drawings.

C. Evaporation Control System:
1. Electronic microprocessor based unit in enclosed case, proportional integral control with adaptive superheat, maximum operating pressure function, preselection allowance for electrical defrost and hot gas bypass.
2. Electrical Characteristics: per drawings.

D. Refrigeration System Control: Electronic microprocessor based unit in enclosed case, with proportional integral control of valve, on/off thermostat, air temperature alarm (high and low), solenoid valve control, liquid injection adaptive superheat control, maximum operating pressure function, night setback thermostat, timer for defrost control.

2.15 RECEIVERS

A. Manufacturers:
1. Henry Technologies: www.henrytech.com/#sle.
2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com/#sle.
3. Sherwood Valve/Harsco Corporation: www.sherwoodvalve.com/#sle.

B. Internal Diameter 6 inch and Smaller:
1. AHRI 495, UL listed, steel, brazed; 400 psi maximum pressure rating, with tappings for inlet, outlet, and pressure relief valve.

C. Internal Diameter Over 6 inch:

1. AHRI 495, welded steel, tested and stamped in accordance with ASME (BPV VIII, 1); 400 psi with tappings for liquid inlet and outlet valves, pressure relief valve, and magnetic liquid level indicator.

2.16 FLEXIBLE CONNECTORS

A. Manufacturers:
   1. Circuit Hydraulics, Ltd: www.circuit-hydraulics.co.uk.
   2. Flexicraft Industries: www.flexicraft.com/#sle.
   3. Penflex: www.penflex.com/#sle.

B. Corrugated stainless steel or bronze hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure of 500 psi.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of or recessed into and grouted flush with slab.

G. Pipe Hangers and Supports:
   1. Install in accordance with ASTM F 708 and MSS SP-89.
   2. Support horizontal piping as scheduled.
   3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   4. Place hangers within 12 inches of each horizontal elbow.
   5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
   6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   7. Provide copper plated hangers and supports for copper piping.

H. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

I. Provide clearance for installation of insulation and access to valves and fittings.

J. Provide access to concealed valves and fittings. Coordinate size and location of access doors with Section 08 31 00.

K. Flood piping system with nitrogen when brazing.

L. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.

M. Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 90 00.

N. Insulate piping and equipment; refer to Section and Section 22 07 16.

O. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

P. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.

Q. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

R. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

S. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

T. Fully charge completed system with refrigerant after testing.

U. Provide electrical connection to solenoid valves. Refer to Section 26 27 17.

3.03 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5.

B. Test system pressure in-line with manufacturer's requirements. Minimum 500 micron vacuum (triple evacuation), dry nitrogen to 200 PSI.

C. Prepare test and inspection reports for review by Cx agent.

3.04 SCHEDULES

A. Hanger Spacing for Copper Tubing.
1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 3/8 inch.
2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 3/8 inch.
3. 1-3/8 inch OD: Maximum span, 7 feet; minimum rod size, 3/8 inch.
4. 1-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. 2-1/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
6. 2-5/8 inch OD: Maximum span, 9 feet; minimum rod size, 3/8 inch.
7. 3-1/8 inch OD: Maximum span, 10 feet; minimum rod size, 3/8 inch.
8. 3-5/8 inch OD: Maximum span, 11 feet; minimum rod size, 1/2 inch.
9. 4-1/8 inch OD: Maximum span, 12 feet; minimum rod size, 1/2 inch.

B. Hanger Spacing for Steel Piping.
1. 1/2 inch, 3/4 inch, and 1 inch: Maximum span, 7 feet; minimum rod size, 3/8 inch.
2. 1-1/4 inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
3. 1-1/2 inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. 2 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. 2-1/2 inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
6. 3 inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.
7. 4 inches: Maximum span, 12 feet; minimum rod size, 1/2 inch.

END OF SECTION

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SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonmetal ducts.

B. Ducts for kitchen exhaust applications.

C. Metal ductwork.

D. Casing and plenums.

E. Kitchen hood ductwork.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 09 90 00 - Painting and Coating: Weld priming, weather resistant, paint or coating.

C. Section 11 40 00 - FOODSERVICE EQUIPMENT: Supply of kitchen range hoods for placement by this Section.

D. Section 23 07 13 - Duct Insulation: External insulation and duct liner.

E. Section 23 33 00 - Air Duct Accessories.

F. Section 23 36 00 - Air Terminal Units.

G. Section 23 37 00 - Air Outlets and Inlets.

H. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.

E. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

G. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

H. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe; 2020.

I. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, Culvert Pipe (Metric); 2020.

J. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2020.

K. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric); 2020.

L. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

M. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2018.

N. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2021.

O. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012, 2nd Edition.

P. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

Q. SMACNA (FGD) - Fibrous Glass Duct Construction Standards; 2003.

R. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.

S. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; current edition, including all revisions.

T. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.

U. UL 2221 - Tests of Fire Resistive Grease Duct Enclosure Assemblies; Current Edition, Including All Revisions.

V. IECC 2012 - International Energy Conservation Code - Duct construction standards, leakage testing

1.04 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for duct materials and duct connections.

C. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for all systems.

D. MANDATORY Test Reports: Pressure test all ductwork. Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.
   1. Utilize standard equation CL=F/P^0.65 where CL = Leakage Class, F= Measured leakage rate in CFM per 100 square feet of duct surface, and P = Static Pressure of the test. Leakage class shall not exceed 16 for rectangular duct or 8 for round duct.

E. Manufacturer's Certificate: Certify that installation of glass fiber ductwork meet or exceed recommended fabrication and installation requirements.

F. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum five years of documented experience.

1.07 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A, NFPA 90B, and NFPA 96 standards.

1.08 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

2.02 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.

B. Aluminum for Ducts: ASTM B209 (ASTM B209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.

C. Stainless Steel for Ducts: ASTM A 240/A 240M, Type 304.

D. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

E. Flexible Ducts:
   1. Two ply vinyl film supported by helically wound spring steel wire.
      a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
      b. Maximum Velocity: 4000 fpm.
      c. Temperature Range: -10 degrees F to 160 degrees F.

F. Insulated Flexible Ducts:
   1. Two ply vinyl film supported by helically wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.
      a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
      b. Maximum Velocity: 4000 fpm.
      c. Temperature Range: -10 degrees F to 160 degrees F.

G. Stainless Steel Ducts: ASTM A 666, Type 304.

H. All Ducts: Galvanized steel, unless otherwise indicated.

I. Low Pressure Supply (Heating Systems): 1 inch w.g. pressure class, galvanized steel.

J. Low Pressure Supply (System with Cooling Coils): 1 inch w.g. pressure class, galvanized steel.

K. Medium and High Pressure Supply (All VAV Primary Supply Duct between AHU and VAV Terminal Unit): 2 inch w.g. pressure class, galvanized steel.

L. Return and Relief: 1 inch w.g. pressure class, galvanized steel.

M. General Exhaust: 1 inch w.g. pressure class, galvanized steel.

N. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
   1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
   2. VOC Content: Not more than 250 g/L, excluding water.

O. Grease Exhaust: 1 inch w.g. pressure class, stainless steel.
   1. Construct of 18 gage stainless steel.
   2. Construction:
      a. Liquid tight with continuous external weld for all seams and joints.
      b. Where ducts are not self draining back to equipment, provide low point drain pocket with copper drain pipe to sanitary sewer.
   3. Access Doors:
      a. Provide for duct cleaning inside horizontal duct at drain pockets, every 20 feet and at each change of direction.
      b. Use same material and thickness as duct with gaskets and sealants rated 1500 degrees F for grease tight construction.
   4. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E 84.

2.03 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide turning vanes. .

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

E. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards.

F. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

G. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

H. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.04 MANUFACTURED DUCTWORK AND FITTINGS

A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

B. Double Wall Insulated Round Ducts: Round spiral lockseam duct with paintable galvanized steel outer wall, perforated galvanized steel inner wall; fitting with solid inner wall. Provide paint in color selected by architect.
   1. Manufacture in accordance with SMACNA HVAC Duct Construction Standards.
   2. Insulation:
      a. Thickness: 2 inch, Minimum R-8.
      b. Material: Fiberglass, with mylar coating between insulation and perforated liner.

C. Double Wall Insulated Rectangular Ducts: Rectangular spiral lockseam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with solid inner wall.
   1. Insulation:
      a. Thickness: 2 inch, Minimum R-8

D. Transverse Duct Connection System: SMACNA "J" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.
   1. Manufacturers:

2.05 CASINGS

A. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards and construct for operating pressures indicated.

B. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of 18 gage galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.

C. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of 18 gage galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.

D. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.
   1. Provide clear wire glass observation ports, minimum 6 X 6 inch size.

2.06 DUCTS FOR KITCHEN EXHAUST APPLICATIONS

A. Provide ductwork, fittings, and appurtenances per NFPA 96, SMACNA (KVS), UL 1978, and UL 2221 requirements and guidelines.

B. Class 1 duct for air with gas and grease particle exhaust at an air velocity of 1,500 to 2,500 fpm.

C. Where ducts are not self-draining back to equipment, provide low point drain pocket with the copper drain pipe to a sanitary sewer.

D. Designed, fabricated, and installed to be liquid tight preventing exhaust leakage into the building.

E. Dishwasher Exhaust Duct:
   1. Duct Size: 1/2 in-wc pressure class stainless steel.
   2. Fabricate using single wall, 20-gauge, 0.035-inch Type 304 stainless steel with external welded joints.
   3. Seal joints during installation with factory-supplied overlapping V-bands and sealant.

F. Kitchen Hood and Grease Exhaust Duct:
   1. Fabricate in accordance with ductwork manufacturer's instructions, SMACNA (DCS), SMACNA (KVS), and NFPA 96.

2.07 KITCHEN HOOD EXHAUST DUCTWORK

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, SMACNA Kitchen Ventilation Systems and Food Service Equipment Fabrication & Installation Guidelines and NFPA 96.

2.08 DISHWASHER EXHAUST DUCTWORK

A. Fabricate dishwasher head exhaust ducts with 18 gauge stainless steel. Weld and flange seams and joints.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide flexible duct connectors at all motorized equipment.

B. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards.

C. Install in accordance with manufacturer's instructions.

D. Comply with safety standards NFPA 90A and NFPA 90B.

E. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

F. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

G. Kitchen Hood Exhaust: Provide residue traps at base of vertical risers with provisions for clean out.

H. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

I. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

J. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

K. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

L. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

M. Use double nuts and lock washers on threaded rod supports.

N. Tape joints of PVC coated metal ductwork with PVC tape.

O. Connect terminal units to supply ducts with one foot maximum length of flexible duct. Do not use flexible duct to change direction.

P. Connect diffusers or light troffer boots to low pressure ducts with 5 feet maximum length of flexible duct held in place with strap or clamp.

Q. Connect flexible ducts to metal ducts with adhesive plus sheet metal screws.

R. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

S. Use stainless steel for ductwork exposed to view and stainless steel or carbon steel for ducts where concealed.

T. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

U. At exterior wall louvers, seal duct to louver frame and install blank-out panels as required.

3.02 RANGE HOOD EXHAUST DUCT INSTALLATIONS

A. Install ducts to allow for thermal expansion of ductwork through 2000 deg F temperature range.

B. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for clean out.

C. Install ducts without dips or traps that may collect residues, unless traps have continuous or automatic residue removal.

D. Install access openings at each change in direction and at 50-foot intervals; locate on sides of duct a minimum of 1-1 1/2 inches from bottom; and fit with grease-tight covers of same material as duct.

E. Do not penetrate fire-rated assemblies.

3.03 DISHWASHER EXHAUST DUCT INSTALLATIONS

A. Install dishwasher exhaust ducts according to SMACNA's "HVAC Duct Construction Standards-Metal and Flexible."

3.04 CLEANING AND TESTING

A. Conduct required duct-leakage testing for all ductwork as defined within this specification and otherwise noted in the contract documents.

3.05 SCHEDULES

A. Ductwork Material:
   1. Low Pressure Supply (Heating Systems): Steel, Aluminum.
   2. Low Pressure Supply (System with Cooling Coils): Steel, Aluminum.
   3. Medium and High Pressure Supply: Steel.
   4. Return and Relief: Steel, Aluminum.
   5. General Exhaust: Steel, Aluminum.
   6. Kitchen Hood Exhaust: Stainless Steel.
   7. Dishwasher Exhaust: Stainless Steel.
   8. Outside Air Intake: Steel.
   9. Exposed round ductwork: Double-walled spiral.

B. Ductwork Pressure Class:
   1. Supply (Heating Systems): 1 inch

2. Supply (System with Cooling Coils): 2 inch.
3. Return and Relief: 1 inch.
4. General Exhaust: 1 inch.
5. Outside Air Intake: 2 inch.

END OF SECTION

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SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air turning devices/extractors.
B. Backdraft dampers - metal.
C. Backdraft dampers.
D. Combination fire and smoke dampers.
E. Duct access doors.
F. Duct test holes.
G. Fire dampers.
H. Flexible duct connections.
I. Smoke dampers.
J. Volume control dampers.

1.02 RELATED REQUIREMENTS

A. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
B. Section 23 31 00 - HVAC Ducts and Casings.
C. Section 23 36 00 - Air Terminal Units: Pressure regulating damper assemblies.
D. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.
B. NFPA 92 - Standard for Smoke Control Systems; 2018.
C. NFPA 92A - Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences; 2012.
D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).
E. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.
F. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.
G. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.
C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers, duct access doors, and duct test holes.
D. Manufacturer's Installation Instructions: Provide instructions for fire dampers and combination fire and smoke dampers.

1.05 PROJECT RECORD DOCUMENTS

A. Record actual locations of access doors and test holes.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

1.08 EXTRA MATERIALS

A. See Section 01 6000 - Product Requirements, for additional provisions.

B. Provide two of each size and type of fusible link.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. Manufacturers:
   1. Krueger: www.krueger-hvac.com/#sle.
   2. Ruskin Company: www.ruskin.com/#sle.
   3. Titus: www.titus-hvac.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.02 BACKDRAFT DAMPERS - METAL

2.03 BACKDRAFT DAMPERS

A. Manufacturers:
   1. Louvers & Dampers, Inc: www.louvers-dampers.com/#sle.
   2. Nailor Industries Inc: www.nailor.com/#sle.
   3. Ruskin Company: www.ruskin.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.04 BACKDRAFT DAMPERS - FABRIC

A. Fabric Backdraft Dampers: Factory-fabricated, 18 gage, galvanized steel frame.
   1. Blades: Neoprene coated fabric material.
   2. Birdscreen: 1/2 inch nominal mesh of galvanized steel or aluminum.
   3. Maximum Velocity: 1000 fpm (5 m/sec) face velocity.

B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: galvanized steel or extruded aluminum, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.05 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers:
   1. Louvers & Dampers, Inc: www.louvers-dampers.com/#sle.
   2. Nailor Industries Inc: www.nailor.com/#sle.
   3. Ruskin Company: www.ruskin.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

C. Provide factory sleeve and collar for each damper.

D. Multiple Blade Dampers: Fabricate with 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch actuator shaft.

E. Operators: UL listed and labelled spring return electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on interior of duct and link to damper operating shaft.

F. Normally Closed Smoke Responsive Fire Dampers: Curtain type, opening by gravity upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure.

G. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.

2.06 DUCT ACCESS DOORS

A. Manufacturers:
1. Nailor Industries Inc: www.nailor.com/#sle.
2. Ruskin Company: www.ruskin.com/#sle.
3. SEMCO Incorporated: www.semcoinc.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

C. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.
1. Less Than 12 inches Square: Secure with sash locks.
2. Up to 18 inches Square: Provide two hinges and two sash locks.
3. Up to 24 x 48 inches: Three hinges and two compression latches with outside and inside handles.
4. Larger Sizes: Provide an additional hinge.

D. Access doors with sheet metal screw fasteners are not acceptable.

2.07 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.08 FIRE DAMPERS

A. Manufacturers:
1. Louvers & Dampers, Inc: www.louvers-dampers.com/#sle.
2. Nailor Industries Inc: www.nailor.com/#sle.
3. Ruskin Company: www.ruskin.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

C. Ceiling Dampers: Galvanized steel, 22 gage frame and 16 gage flap, two layers 0.125 inch ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.

D. Horizontal Dampers: Galvanized steel, 22 gage frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.

E. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations or closure under air flow conditions. Configure with blades out of air stream except for 1.0 inch pressure class ducts up to 12 inches in height.

F. Multiple Blade Dampers: 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

G. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.09 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
      a. Net Fabric Width: Approximately 6 inches wide.
   2. Metal: 3 inches wide, 24 gage thick galvanized steel.

C. Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

2.10 SMOKE DAMPERS

A. Manufacturers:
   1. Louvers & Dampers, Inc: www.louvers-dampers.com/#sle.
   2. Nailor Industries Inc: www.nailor.com/#sle.
   3. Ruskin Company: www.ruskin.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.

C. Dampers: UL Class 1 multiple blade type fire damper, normally closed automatically operated by 120V electric actuator.

2.11 VOLUME CONTROL DAMPERS

A. Manufacturers:
   1. Louvers & Dampers, Inc: www.louvers-dampers.com/#sle.
   2. Nailor Industries Inc: www.nailor.com/#sle.
   3. Ruskin Company: www.ruskin.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

C. Splitter Dampers:
   1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
   2. Blade: Fabricate of double thickness sheet metal to streamline shape, secured with continuous hinge or rod.
   3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw .

D. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

E. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

F. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

G. Quadrants:
   1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards. Refer to Section 23 31 00 for duct construction and pressure class.

B. Provide access doors at any location where dampers are concealed above inaccessible ceilings.

C. Provide flexible duct connectors at expansion joints and at all connections to motorized equipment.

D. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

E. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

F. Provide duct test holes where indicated and required for testing and balancing purposes.

G. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

H. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.
   1. Smoke dampers shall be integrated into the "smoke purge control system". Dampers in the return ductwork shall be overridden to the open position when the smoke purge is activated.

I. Demonstrate re-setting of fire dampers to Owner's representative.

J. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

K. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment; see Section 22 05 48.

L. For fans developing static pressures of 5.0 inches and over, cover flexible connections with leaded vinyl sheet, held in place with metal straps.

M. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

N. Use splitter dampers only where indicated.

O. Provide balancing dampers on high velocity systems where indicated. Refer to Section 23 36 00 - Air Terminal Units.

P. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

Q. Provide flags at all balancing dampers for TAB procedures. Remove upon completion of T&B work.

END OF SECTION

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SECTION 23 34 23
HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen Ventilation Systems / Roof exhausters.

B. Roof ventilators.

C. Wall exhausters.

D. Inline centrifugal fans.

E. Ceiling exhaust fans.

1.02 RELATED REQUIREMENTS

A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

B. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping Equipment.

C. Section 23 33 00 - Air Duct Accessories: Backdraft dampers.

D. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. AMCA 99 - Standards Handbook; 2016.

B. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2005 (Reaffirmed 2012).

C. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016.

D. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc.; http://www.amca.org/certified/search/company.aspx.

E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.

G. NEMA MG 1 - Motors and Generators; 2014.

H. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2021.

I. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

C. Manufacturer's Instructions: Indicate installation instructions.

D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 5 years of documented experience.

B. Kitchen Range Hood Exhaust Fans: Comply with requirements of NFPA 96.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 FIELD CONDITIONS

A. Permanent ventilators may be used for ventilation during construction only after ductwork is clean, filters are in place, bearings have been lubricated, and fan has been test run under observation.

1.07 EXTRA MATERIALS

A. See Section 01 6000 - Product Requirements, for additional provisions.

B. Supply two sets of belts for each fan.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Greenheck: www.greenheck.com/#sle.

B. Loren Cook Company: www.lorencook.com/#sle.

C. PennBarry: www.pennbarry.com/#sle.

D. American Coolair/ILG: www.coolair.com

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 POWER VENTILATORS - GENERAL

A. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.

B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

C. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.

D. Fabrication: Conform to AMCA 99.

E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.03 ROOF VENTILATORS, KITCHEN VENTILATION SYSTEMS

A. Product Requirements:
   1. Performance Ratings: Determined in accordance with AMCA 210 .
   2. Sound Ratings: AMCA 301, tested to AMCA 300.
   3. Fabrication: Conform to AMCA 99.
   4. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

B. Performance and Model: As indicated on drawings.
   1. Motor: Refer to Section 23 05 13.

C. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

D. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

E. Roof Curb: 20 inch high of galvanized steel with continuously welded seams, factory installed nailer strip.

F. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor .

G. Shunt Trip Breakers: Provide for each fan of 2,000 CFM or greater for interlock with Fire Alarm system.

H. Backdraft Damper: Motor-actuated with junction box and wire whip to open damper upon activation of exhaust fan, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

I. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

J. Make-up Air unit:
   1. Variable-volume direct-fired natural gas makeup air unit with spark ignition, discharge temperature control, and factory disconnect.

2.04 WALL EXHAUSTERS

A. Performance: As indicated on drawings.
   1. Motor: Refer to Section 23 05 13..

B. Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor; 1/2 inch mesh, 0.062 inch thick aluminum wire bird screen.

C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

D. Backdraft Damper: Motorized with junction box and wire whip to open upon activation of exhaust fan, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

E. Sheaves: For V-belt drives, provide cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.05 CABINET AND CEILING EXHAUST FANS

A. Performance: As Indicated on drawings.
   1. Motor: Refer to Section 23 05 13.

B. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, motorized backdraft damper with junction box and wire whip to open upon activation of exhaust fan.

C. Disconnect Switch: Cord and plug in housing for thermal overload protected motor .

D. Grille: Molded white plastic or Aluminum with baked white enamel finish.

E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.06 INLINE CENTRIFUGAL FANS

A. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, motorized backdraft damper with junction box and wire whip to energize damper upon activation of fan.

B. Disconnect Switch: Cord and plug in housing for thermal overload protected motor and wall mounted switch.

C. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in and provide start-up services in accordance with manufacturer's instructions.

B. Secure roof or wall exhausters with aluminum lag screws to roof curb or structure.

C. Extend ducts to roof or wall exhausters into roof curb or structure. Counterflash duct to roof or wall opening.

D. Hung Cabinet Fans:
   1. Install fans with resilient mountings and flexible electrical leads. Refer to Section 23 05 48.
   2. Install flexible connections specified in Section 23 33 00 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

E. Provide sheaves required for final air balance.

F. Install backdraft dampers on inlet to roof and wall exhausters.

G. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

H. Provide manufacturer's representative for (4) hours of demonstration and training of systems.

END OF SECTION

SECTION 23 36 00
AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Variable volume terminal units.

1.02 RELATED REQUIREMENTS

A. Section 23 31 00 - HVAC Ducts and Casings.

B. Section 23 33 00 - Air Duct Accessories.

C. Section 23 37 00 - Air Outlets and Inlets.

1.03 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

B. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; current edition, including all revisions.

1.04 SUBMITTALS

A. See Section 01 33 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate air flow, static pressure, and NC designation. Include electrical characteristics and connection requirements.

C. Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions: Indicate support and hanging details, and service clearances required.

E. Project Record Documents: Record actual locations of units.

F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant volume regulators.

G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 WARRANTY

A. See Section 01 77 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for air terminal units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Daikin: www.daikin.com.

B. JCI: www.jci.com.

C. Enviro-Tec: www.enviro-tec.com.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MANUFACTURED UNITS

A. Ceiling mounted variable air volume supply air control terminals for connection to single duct, central air systems, with electronic variable volume controls, .

B. Identify each terminal unit with clearly marked identification label and air flow indicator. Include unit nominal air flow, maximum factory set airflow, minimum factory set air flow, and coil type.

2.03 SINGLE DUCT VARIABLE VOLUME UNITS

A. Basic Assembly:
   1. Casings: Minimum 22 gage galvanized steel.
   2. Lining: Minimum 1/2 inch thick foil coated or vinyl coated fibrous glass insulation, 1.5 lb/cu ft density, meeting NFPA 90A requirements and UL 181 erosion requirements.
   3. Plenum Air Inlets: S slip and drive connections for duct attachment.
   4. Plenum Air Outlets: S slip and drive connections.

B. Basic Unit:
   1. Configuration: Air volume damper assembly inside unit casing. Locate control components inside protective metal shroud.
   2. Control Transformer: Provide 24V transformer for ATC interface.
   3. Volume Damper: Construct of galvanized steel with peripheral gasket and self lubricating bearings; maximum damper leakage: 2 percent of design air flow at 1 inches rated inlet static pressure.
   4. Mount damper operator to position damper normally open.

C. Automatic Damper Operator:
   1. Electric Actuator: See schedules.

D. Flow Sensor:
   1. Center-mount averaging flow sensor with plenum-rated tubing.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Support units individually from structure. Do not support from adjacent ductwork.

C. Connect to ductwork in accordance with Section 23 31 00.

D. Verify that electric power is available and of the correct characteristics.

3.02 ADJUSTING

A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to 0 percent full flow.

END OF SECTION

SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers.
   1. Perforated ceiling diffusers.

B. Rectangular ceiling diffusers.

C. Slot ceiling diffusers.

D. Registers/grilles.
   1. Ceiling-mounted, exhaust and return register/grilles.
   2. Ceiling-mounted, supply register/grilles.
   3. Wall-mounted, supply register/grilles.
   4. Wall-mounted, exhaust and return register/grilles.
   5. Wall-mounted, grid core exhaust and return register/grilles.

E. Fabric air distribution devices.

F. Door grilles.

G. Louvers.

H. Goosenecks.

1.02 RELATED REQUIREMENTS

A. Section 09 90 00 - Painting and Coating: Painting of ducts visible behind outlets and inlets.

1.03 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2015.

B. ARI 890 - Standard for Air Diffusers and Air Diffuser Assemblies; Air-Conditioning and Refrigeration Institute; 2008.

C. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; 2006 (Reaffirmed 2011).

D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

C. Samples: Submit one of each required air outlet and inlet type.

D. Project Record Documents: Record actual locations of air outlets and inlets.

E. Fabric Duct Dispersion System
   1. Product Data: Submit manufacturer’s specifications on materials and manufactured products used for work of this section.
   2. Building Code Data: Submit UL file number under which product is Classified by Underwriter’s Laboratories for both NFPA 90-A and UL 2518.
   3. Provide detailed drawings confirming configuration of Textile Dispersion System (diameter, lengths, airflow, pressure, and textile permeability).
   4. Provide detailed installation instructions for components to be installed.
   5. Provide warranty and maintenance documentation.

1.05 WARRANTY

A. Manufacturer must provide a 10 Year Product Warranty for products supplied for the fabric portion of this system as well as a Design and Performance Warranty.

1.06 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Test and rate louver performance in accordance with AMCA 500-L.

C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum [five] years of documented experience.

D. Fabric Duct Dispersion System
   1. Building Codes and Standards:
      a. Product must be Classified by Underwriter's Laboratories in accordance with the 25/50 flame spread / smoke developed requirements of NFPA 90-A and UL 2518. Also Classified by UL-C (Canada) S102.2, BS 5867 Part 2, 1980; GB8624-2006.
      b. All product sections must be labeled with the logo and classification marking of Underwriter's Laboratories.
   2. Design & Quality Control
      a. Manufacturer must have documented design support information including duct sizing; vent, orifice, and/or nozzle location; vent, orifice, and/or nozzle sizing; length; and suspension. Parameters for design, including maximum air temperature, velocity, pressure and textile permeability, shall be considered and documented.

1.07 DELIVERY, STORAGE AND HANDLING:

A. Protect textile air dispersion system and SkeleCore Pull-Tight components from damage during shipping, storage, and handling.

B. Where possible, store products inside and protect from weather. Where necessary to store outside, store above grade and enclose with a vented waterproof wrapping

1.08 MOCK-UP

A. Provide mock-up of typical interior and exterior ceiling module with supply and return air outlets.

B. Locate where directed.

C. Mock-up may remain as part of the Work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carnes Company HVAC: www.carnes.com.

B. Krueger: www.krueger-hvac.com/#sle.

C. Price Industries: www.price-hvac.com/#sle.

D. Titus: www.titus-hvac.com/#sle.

E. Tuttle and Bailey: www.tuttleandbailey.com.

F. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 RECTANGULAR CEILING DIFFUSERS

A. Type: Square, stamped, multi-core diffuser to discharge air in 360 degree, one way, two way, three way or four way pattern as shown on drawings and with sectorizing baffles where indicated.

B. Frame: Surface mount or inverted T-bar as indicated on drawings. In plaster ceilings, provide plaster frame and ceiling frame.

C. Fabrication: Aluminum with baked enamel off-white finish.

D. Accessories: Radial opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.03 PERFORATED FACE CEILING DIFFUSERS

A. Type: Perforated face with fully adjustable pattern and removable face.

B. Frame: Surface mount or Inverted T-bar as indicated on drawings. In plaster ceilings, provide plaster frame and ceiling frame.

C. Fabrication: Steel back pan with aluminum frame and baked enamel off-white finish.

D. Accessories: Radial opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.04 CEILING SLOT DIFFUSERS

A. Fabrication: Aluminum extrusions with factory clear lacquer finish.

B. Color: To be selected by Architect from manufacturer's standard range.

C. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket, mitered end border.

D. Plenum: Integral, galvanized steel, insulated.

2.05 CEILING SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, two-way deflection.

B. Frame: 1 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Aluminum extrusions with factory off-white enamel or prime coat finish as indicated on drawings or selected by architect.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.06 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, horizontal face.

B. Frame: 1 inch margin with countersunk screw mounting.

C. Fabrication: Aluminum extrusions, with factory off-white enamel, baked enamel, or prime coated finish as indicated on drawings or selected by architect.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

E. Gymnasiums: Provide front pivoted or welded in place blades, securely fastened to be immobile.

2.07 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Fixed grilles of 1/2 x 1/2 x 1/2 inch louvers.

B. Fabrication: Acrylic plastic with off-white finish.

C. Frame: Channel lay-in frame for suspended grid ceilings.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.08 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, horizontal face, double deflection.

B. Frame: 1 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Aluminum extrusions, with factory off-white enamel, baked enamel, prime coat or clear lacquer finish as indicated on drawings or selected by architect.

D. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

E. Gymnasiums: Provide front pivoted or welded in place blades, securely fastened to be immobile.

2.09 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, horizontal face.

B. Frame: 1 inch margin with countersunk screw mounting.

C. Fabrication: Aluminum extrusions, with factory off-white enamel, baked enamel, prime coated or clear lacquer finish as indicated on drawings or selected by architect.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

E. Gymnasiums: Provide front pivoted or welded in place blades, securely fastened to be immobile.

2.10 WALL GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Fixed grilles of 1/2 x 1/2 x 1/2 inch louvers.

B. Fabrication: Aluminum with factory clear lacquer, off-white enamel or baked enamel finish as indicated on drawings or selected by architect.

C. Frame: 1 inch margin with countersunk screw mounting.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.11 FABRIC AIR DISTRIBUTION DEVICES

A. Manufacturers:
   1. FabricAir, Inc: www.fabricair.com/#sle.
   2. KE Fibertec.
   3. DuctSox Corporation: www.ductsox.com/#sle.
   4. Substitutions: To request a substitution for products not listed, provide complete submittal package to engineer indicating any and all deviations between basis of design and proposed substitution. Substitution request must be completely submitted to engineer not less than 10 business days prior to bid opening for review.

B. Basis of Design: Fabric Air: www.fabricair.com

C. Textile
   1. Fabric Air Combi 70
      a. Duct Shape: Round
      b. Fabric: 100% Flame Retardant Polyester
      c. Weight: 7.67 oz./yd² per ASTM D3776
      d. Shrinkage: Max. 0.5% per EN ISO 5077
      e. Color: As selected by Architect at time of submittal
      f. Temperature Range: -40°F and +284°F
      g. Base Permeability @ 0.5" WG: 2.28 CFM/SQFT per ASTM D737, Shall be verified by the Frazier Permeability Test
      h. Fire Retardancy: Shall meet the requirements of NFPA 90-A, ICC AC167 and UL 2518
      i. Warranty: 10 years

D. System Fabrication Requirements
   1. The system is made with sewn in, but still removable, aluminum hoops. The rods support the shape of the fabric system by 180° (8”-48”), 120° (49”-60”), 90° (61”-68”) and 60° (69”-80”). Hoops must be pre-installed from factory, no installation at site. Diameter of hoops and distance between as specified by manufacturer.
   2. Elbows of 70° or more to have 2 hoops sewn in order to maintain shape.

3. Air dispersion shall be accomplished with linear arrays of laser cut orifices. Orifices shall be from 0.12" to 0.55" diameter. Due to exact throw requirements and NC requirements alternative flow models are not acceptable.
4. Number, spacing, and size of linear arrays of laser cut orifices shall be determined by the manufacturer.
5. Fabric system shall include connectors to attach to suspension system listed below.
6. Provide system in sections optimized for maintenance, connected by zippers. Zippers shall provide closure completely around the circumference to prevent leakage. Required number of zippers shall be specified by the manufacturer.
7. Each section to have a unique tag including information about manufacturers order number, position, diameter of section, length of section, maintenance instruction, code compliance and contact details for spare parts.

E. Design Parameters
1. Textile air diffusers shall be designed to 3” maximum, with 0.5” as the standard.
2. Textile air diffusers shall be limited to design temperatures between 0 degrees F and 180 degrees F (-17.8 degrees C and 82 degrees C).
3. System overall design; diameter, length, airflow, operating static pressure and dispersion shall be designed or approved by the manufacturer.
4. Do not use textile diffusers in concealed locations.
5. Use textile air dispersion systems only for positive pressure air distribution components of the mechanical ventilation system.

F. Hangers and Supports
1. Type 8: One row H-rail/cable system located 2" above 12 o'clock of FabricAir system. Hardware to include H-rail joint, eye bolt, end cap H-rail, cable, tie down strap and H-rail as required. FabricAir system shall be attached to hardware using one single row of plastic sliders located 12 o'clock spaced 20 inches.
   a. Hardware
      1) Anodized Aluminum H-Rails - With PVC coated Galvanized Steel suspension cable. Suspension cable clamps, H-rail suspension eyebolts, and all other factory supplied metal components shall be Galvanized Steel.
      2) PVC Coated Galvanized Steel Tensioning and Suspension Cable - Cable clamps, cable tensioners, and all other factory supplied metal components shall be Galvanized Steel.

2.12 DOOR GRILLES

A. Type: V-shaped louvers of 20 gage thick steel, 1 inch deep on 1/2 inch centers.

B. Frame: 20 gage steel with auxiliary frame to give finished appearance on both sides of door, with factory prime coat finish.

2.13 LOUVERS

A. Type: 4 inch or 6 inch deep as indicated on drawings with blades on 45 degree slope , heavy channel frame, 1/2 inch square mesh screen over exhaust and 1/2 inch square mesh screen over intake.

B. Color: To be selected by Architect from manufacturer's standard range. Provide Kynar / Hylar 500 Finish.

C. Fabrication: 12 gage, 0.1046 inch thick extruded aluminum, welded assembly, with factory prime coat finish.

D. Fabrication: 12 gage thick extruded aluminum, welded assembly, with factory prime coat, baked enamel, anodized or fluoropolymer spray finish as indicated on drawings or selected by architect.

E. Mounting: Furnish with exterior angle flange, screw holes in jambs or masonry strap anchors for installation.

2.14 GOOSENECKS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards of minimum 18 gage stainless steel.

B. Mount on minimum 12 inch high curb base where size exceeds 9 x 9 inch.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Insulate opposite side of air distribution for all supply diffusers or registers (top-side or back-side).

C. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

D. Install diffusers to ductwork with air tight connection.

E. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

F. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 90 00.

G. Fabric Duct Dispersion System
   1. Installation of Textile Air Dispersion System
      a. Install chosen suspension system in accordance with the requirements of the manufacturer. Instructions for installation shall be provided by the manufacturer with product.
   2. Cleaning and Protection
      a. Clean air handling unit and ductwork prior to the textile dispersion system unit-by-unit as it is installed. Clean external surfaces of foreign substance which may cause corrosive deterioration of facing.
      b. Temporary Closure: At ends of ducts which are not connected to equipment or distribution devices at time of ductwork installation, cover with polyethylene film or other covering which will keep the system clean until installation is completed.
      c. If textile dispersion systems become soiled during installation, they should be removed and cleaned following the manufacturers cleaning instructions.

3.02 AIR OUTLET AND INLET SCHEDULE

A. See Drawings

END OF SECTION

SECTION 23 38 13
COMMERCIAL-KITCHEN HOODS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cooking hoods.

B. Condensate (dishwashing) hoods.

1.02 RELATED REQUIREMENTS

A. Section 10 44 00 - Fire Protection Specialties: Hand held fire extinguishers.

B. Section 11 40 00 - FOODSERVICE EQUIPMENT: General provisions for hoods.

C. Section 28 31 00 - Fire Detection and Alarm: Connection of hood fire extinguishing system and fire dampers to building fire alarm system.

D. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Connection of hood fire extinguishing system to sprinkler system.

E. Section 22 10 06 - Plumbing Piping Specialties: Floor drains for indirect discharge.

F. Section 22 10 06 - Plumbing Piping Specialties: Electrically-operated gas valve for cooking equipment.

G. Section 23 31 00 - HVAC Ducts and Casings: Exhaust and make-up air ducts.

1.03 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

B. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2021.

C. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.

D. UL 710 - Standard for Exhaust Hoods for Commercial Cooking Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions, adjusting and balancing methods.

PART 2 PRODUCTS

2.01 HOOD CONSTRUCTION

A. Provide products that comply with NFPA 96, the requirements and recommendations of SMACNA Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines, and the requirements of the authorities having jurisdiction.

B. Cooking Hoods: Provide Type I hoods, with all external joints and seams continuously welded, liquid-tight, and all internal joints, seams, and attachments sealed liquid-tight and grease-tight.
   1. Provide fire extinguishing system for all cooking hoods.
   2. Provide complete assemblies listed and labeled by UL under UL 710 for its intended use.
   3. Provide hoods and exhaust ducts rated for zero clearance to combustible construction.

C. Condensate Hoods: Provide Type II hoods with all joints and seams liquid-tight.
   1. Inside the bottom perimeter provide an integral formed condensate gutter:
   2. Gutter Dimensions: 3 inches wide with one inch flange turned up at 45 degree angle.
   3. Drain: Stainless steel, one inch diameter, located in back corner of gutter.

4. Pipe drain to nearest sink drainboard or floor drain.

D. Construction: All materials, inside and out, stainless steel complying with ASTM A666, Type 304, stretcher leveled; unless otherwise indicated.
   1. Sheet Thickness: 18 gage, 0.048 inch, minimum.
   2. Fabrication: Fabricate each individual hood in one piece, with all welds ground and finished to match (inside and out); fabricate flat surfaces exposed to view as double-pan formed panels with internal stiffener members.
   3. Finish on Surfaces Exposed to View: No.4 (brushed directional); provide stainless steel faces on all sides exposed to view.
   4. Finish on Concealed Surfaces: No.4 or No.2B (dull, matte).
   5. Duct Collars: For exhaust and make-up air openings, provide duct collar welded to hood unit; minimum of 8 inches extension from top or back face of unit, with minimum one inch 90 degree flange, unless otherwise indicated.
   6. Access Panels: Provide removable or hinged access panels sufficient for maintenance and replacement of operating components inside unit; maximum width of 40 inches.
   7. Supports: Stainless steel mounting brackets, struts, and threaded hanger rods.
      a. Hanger Rods: 3/8 inch diameter, minimum.
      b. Hanger Spacing: 48 inches on center, maximum.
      c. Attachment to Structure: Mechanical fittings or inserts, stainless steel.

E. Make-Up Air System: Provide volume damper at inlet, accessible for balancing.
   1. Diffusers: Louvered register with opposed blade dampers.
   2. Plenum: Insulated with one inch thick foil-face fiberglass insulation, on inside of plenum.
   3. Provide shunt-trip breakers for interlock with Fire Alarm system.

2.02 HOOD ACCESSORIES

A. Fire Extinguishing System: Comply with NFPA 96.
   1. Exposed Piping Under Hood: Stainless steel or chrome plated.
   2. Exposed Piping Outside Hood: Not permitted.
   3. Nozzles: Stainless steel or chrome plated brass.
   4. Electrical Components: Provide all components required for properly operating system, including but not limited to wiring, raceways, contactors, circuit breakers, switches and solenoids.
   5. Manual Actuators: Wall-mounted pull stations; provide one near each hood and one near exit door.

B. Controls:
   1. Fans: Provide manual push button controls for starting and stopping fans and labeled indicator lights showing fan status.
   2. Fans: Provide controls for fan operation by time clock, programmable by the week, capable of maintaining time cycle after operation of manual push buttons.
   3. Cooking Equipment: Provide manual shutoff and reset button located where indicated; combine with fire extinguishing actuation.
   4. Fire Extinguishing System: Provide automatic actuation complying with NFPA 96; provide local and remote manual actuating stations clearly labeled "Hood Fire Protection"; upon actuation of fire extinguishing system, automatically:
      a. Shut off fans serving that hood.
      b. Shut off fuel source to equipment under hood; actuate solenoid gas valves provided as part of gas piping work.
      c. Shut off electric power to equipment under hood; actuate contactors or switches provided as part of electrical work.
      d. Signal building fire alarm system; normally-open contacts.

C. Control Panels: Factory assembled and pre-wired, ready for utility connections.
   1. UL listed for use with specific hood.
   2. Provide a single control panel combining all control functions for a particular hood, unless otherwise indicated.

3. Provide a single control panel for each group of hoods served by a single exhaust fan.
4. Enclosures: Flush-mounted; stainless steel, to match hood.
5. Provide indicator lights on control panel door showing status of fans and power supply.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that overhead supports are installed in correct locations.

B. Do not begin installation until substrates have been properly prepared.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and NFPA 96.

B. Install hoods level and plumb, securely fastened, with seismic restraints as specified, and free of vibration during normal operation.

C. Weld hood duct collars to ductwork, liquid-tight.

D. Connect to utilities.

3.04 SYSTEM STARTUP

A. Obtain the services of the manufacturer's representative experienced in the installation, adjustment, and operation of the equipment to supervise the starting and adjusting of equipment.

B. Prepare equipment for startup, start and operate equipment for sufficient period to verify proper operation; correct equipment not operating correctly.

C. Test liquid carrying components for leaks.

D. Adjust volume dampers as required for proper air flow after building air handling systems have been balanced and adjusted.

E. Demonstrate operation to Owner's designated personnel.

F. Demonstrate operation to authorities having jurisdiction if required by them; comply with their requirements for demonstration.

G. Report deficiencies in writing to Architect.

3.05 CLOSEOUT ACTIVITIES

A. Conduct training of Owner's designated personnel in the operation and maintenance of equipment.

B. Perform at least 2 hours of training, for minimum of 2 people, at project site.

C. Arrange training sessions with Owner at least 2 weeks in advance.

D. Have operation and maintenance data on hand for training sessions.

3.06 CLEANING

A. Clean surfaces of equipment.

3.07 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

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SECTION 23 55 33
FUEL-FIRED UNIT HEATERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gas fired unit heaters.

B. Tubular infrared heaters.

C. Fuel fired packaged air units.

1.02 RELATED REQUIREMENTS

A. Section 23 05 13 - Motor Requirements for HVAC and Plumbing Equip: Fan motors.

B. Section 23 05 48 - Vibration and Seismic Con. for Equipment.

C. Section 23 07 13 - Duct Insulation: Duct liner.

D. Section 23 31 00 - HVAC Ducts and Casings.

E. Section 23 51 00 - Breechings, Chimneys, and Stacks.

F. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. ASHRAE Std 103 - Method of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers; 2022.

C. NFPA 54 - National Fuel Gas Code; 2018.

D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

E. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; 2019.

PART 2 PRODUCTS

2.01 GAS FIRED UNIT HEATERS

A. Unit Heaters: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heat exchanger, burner, controls, and accessories:
   1. Heating: Natural gas fired.
   2. Discharge Louvers: Individually adjustable horizontal and vertical louvers to match cabinet finish.

B. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors, glass fiber insulation and reflective liner.

C. Supply Fan: Propeller type with direct drive, variable pitch motor pulley.

D. Heat Exchanger: Aluminized steel welded construction.

E. Gas Burner:
   1. Atmospheric type with adjustable combustion air supply.
   2. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
   3. Electronic pilot ignition, with electric spark igniter.

F. Gas Burner Safety Controls:
   1. Thermocouple Sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
   2. Vent Safety Shutoff Sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.

G. Operating Controls:

1. Room Thermostat: Cycles burner to maintain room temperature setting.

H. Performance:
1. Ratings: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than requirements of ASHRAE Std 90.1 I-P; seasonal efficiency to ASHRAE Std 103.

2.02 TUBULAR INFRARED HEATERS

A. Infrared Heaters: Tubular type; packaged, partially factory assembled, pre-wired unit consisting of cabinet, burner, heat exchanger, radiant tube, reflector, controls; for natural gas.

B. Heat Exchanger: Aluminized tubular steel combustion chamber with aluminized steel tube with aluminum reflector.

C. Gas Burner:
1. Gas Burner: Forced draft type with adjustable combustion air supply.
2. Gas valve provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
3. Electronic pilot ignition, with electric spark igniter.
4. Non-corrosive burner air blower with permanently lubricated motor.

D. Gas Burner Safety Controls: Thermo-couple sensor prevents opening of solenoid gas valve until pilot flame is proven and stops gas flow on ignition failure.

E. Operating Controls: Low voltage room thermostat cycles burner to maintain room temperature setting.

F. Performance:
1. Refer to Schedule. Gas heating capacities are sea level ratings.

2.03 FUEL FIRED PACKAGED AIR UNITS

A. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet and supply fan assembly, and duct furnaces each consisting of heat exchanger and burner.

B. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors, glass fiber insulation and reflective liner.

C. Supply Fan: Centrifugal type rubber mounted with belt drive, variable pitch motor pulley.

D. Filter: 1 inch thick glass fiber throw-away type, located to filter air before fan.

E. Gas Fired Duct Furnace Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, heat exchanger, burner, controls, and accessories.
1. Heat Exchanger: Aluminized steel welded construction.
2. Gas Burner:
a. Atmospheric type with adjustable combustion air supply.
b. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
c. Electronic pilot ignition, with electric spark igniter.
3. Gas Burner Safety Controls:
a. Thermocouple Sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
b. Vent Safety Shutoff Sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
4. Performance:
a. Ratings: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than requirements of ASHRAE Std 90.1 I-P; seasonal efficiency to ASHRAE Std 103.

F. Mixing Dampers:
1. Dampers: Outside and return dampers with damper operator and control package to automatically vary outside air quantity. Outside air damper shall fall to closed position.
2. Damper Operator: 24 volt with gear train sealed in oil.

3. Mixed Air Control Sequence: Maintain selected supply air temperature and return dampers to minimum position on call for heating.

G. Performance:
1. Ratings: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than requirements of ASHRAE Std 90.1 I-P; seasonal efficiency to ASHRAE Std 103.

H. Disconnect Switch: Factory mount disconnect switch in control panel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that space is ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available.

C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

A. Install in accordance with NFPA 90A.

B. Install gas fired units in accordance with NFPA 54 and applicable codes.

C. Provide vent connections in accordance with NFPA 211. Refer to Section 23 51 00.

D. Install unit heaters with vibration isolation. Refer to Section 23 05 48.

E. Provide connection to electrical power systems; refer to Section 26 27 17.

F. Provide connection to building automation system as specified elsewhere in this division.

G. Provide manufacturer's recommended startup services and demonstration and training to Owner.

3.03 SCHEDULES

END OF SECTION

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SECTION 23 74 13

PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged roof top unit.

B. Unit controls.

C. Remote panel.

D. Mounting curb and base.

E. Maintenance service.

1.02 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008, Including All Addenda.

B. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment; 2015.

C. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks; 2016, with Errata (2020).

D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

1.03 SUBMITTALS

A. See Section 01 33 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

C. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

D. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.

E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect units from physical damage by storing off site until roof mounting curbs are in place, ready for immediate installation of units.

1.06 WARRANTY

A. Provide a five year warranty to include coverage for refrigeration compressors and heat exchangers.

1.07 MAINTENANCE SERVICE

A. Furnish service and maintenance of packaged roof top units for one year from Date of Substantial Completion.

B. Provide maintenance service with a two month interval as maximum time period between calls. Provide 24-hour emergency service on breakdowns and malfunctions.

C. Include maintenance items as outlined in manufacturer's operating and maintenance data, including minimum of six filter replacements, minimum of one fan belt replacement, and controls check-out, adjustments, and recalibration.

D. Submit copy of service call work order or report, and include description of work performed.

1.08 EXTRA MATERIALS

A. Provide two sets of filters.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. York/JCI

B. Trane Horizon

C. Daikin

2.02 AIR CONDITIONING UNITS

A. General: Roof mounted packaged units having gas burner as scheduled and electric refrigeration heat pumps for heating and cooling.

B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, return fan, heat exchanger and burner, , energy recovery section (where noted in the schedule), factory-mounted controls, air filters, gas heating coil, refrigerant cooling coil, variable-capacity compressors and hot-gas reheat circuits, condenser coil and condenser fan as scheduled.

C. Disconnect Switch: Factory mount disconnect switch on equipment under provisions of Section 26 27 17.

2.03 FABRICATION

A. Cabinet: Galvanized steel with baked enamel finish, factory finished in custom color as selected by the architect including access doors with piano hinges and locking handle. Structural members shall be minimum 18 gage, with access doors or panels of minimum 20 gage.

B. Insulation: two inch thick minimum glass fiber or injected foam, double-walled unit construction.

C. Heat Exchangers: Stainless steel, of welded construction.

D. Supply and Return and Exhaust Fan as scheduled: Backward inclined or airfoil type, resiliently mounted with V-belt drive and adjustable variable pitch motor pulley, and rubber isolated hinge mounted high efficiency motor or direct drive as indicated. Isolate complete fan assembly. Provide factory-mounted variable-frequency drives for all fan motors.

E. Air Filters: Minimum efficiency reporting value (MERV) of at least 13 on OA and 8 on RA air streams.

F. Vibration Isolation: Units are to be mounted on steel dunnage. Provide enclosed spring isolators having minimum 2" static deflection.

G. Provide 120V convenience receptacle and vapor-tight LED light fixtures in fan sections. Outlet and lights are to receive power directly from unit-mounted transformer.

H. Provide unit as side-discharge or downflow arrangement as noted on drawings.

2.04 BURNER

A. Gas Burner: Forced draft type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot. Provide turndown ratio as indicated in the schedule.

B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after air flow proven and slight delay, allow gas valve to open.

C. High Limit Control: Temperature sensor with fixed stop at maximum permissible setting, de-energize burner on excessive bonnet temperature and energize burner when temperature drops to lower safe value.

D. Supply Fan Control: Temperature sensor sensing bonnet temperatures and independent of burner controls, with provisions for continuous fan operation.

2.05 EVAPORATOR COILS

A. Provide copper tube aluminum fin coil assembly with stainless steel drain pan and connection for cooling coils.

B. Provide thermostatic expansion valves for units of 6 tons capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons cooling capacity and larger.

2.06 COMPRESSOR

A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gage ports, and filter drier.

B. Five minute timed off circuit to delay compressor start.

C. Outdoor thermostat to energize compressor in cooling mode above 35 degrees F ambient or heating mode below 70 degrees F ambient.

D. Provide modulating capacity control by variable-capacity scroll technology and/or adjusting variable-speed compressors.

E. For heat pump units, provide reversing valve, suction line accumulator, discharge muffler, flow control check valve, and solid-state defrost control utilizing thermistors.

F. Provide hot-gas reheat coil for humidity control.

2.07 CONDENSER OR OUTDOOR COIL

A. Provide copper tube aluminum or copper fin coil assembly with subcooling rows and coil guard.

B. Provide factory-applied marine / coastal-rated coating over entire coil and fin assembly approved for highly corrosive environments.

C. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.

D. Provide refrigerant pressure switches to cycle condenser fans.

E. Provide variable frequency drives on all condenser fans for active head pressure control.

2.08 MIXED AIR CASING

A. Dampers: Provide outside, return, and relief dampers with damper operator and control package to automatically vary outside air quantity. Outside air damper to fall to closed position.

B. Gaskets: Provide tight fitting dampers with edge gaskets.

C. Damper Operator, Units 7.5 Ton Cooling Capacity and Larger: 24 volt with gear train sealed in oil with spring return on.

D. Outdoor airflow monitoring station: Provided at intake of the unit.

E. Mixed Air Controls: Maintain selected supply air temperature and return dampers to minimum position on call for heating and above 70 degrees (F) ambient, or when ambient air enthalpy exceeds return air enthalpy.

2.09 OPERATING CONTROLS

A. Provide factory controller and all necessary sensors and components for operation of refrigerant system, fan VFDs based on single-zone VFD control, energy recovery wheel, humidity control

function, and economizer function. The humidity control (dehumidification sequence) shall be capable of being enabled when the unit is in both heating and cooling modes. The humidistat setpoint shall govern control of this sequence.

B. Provide BACnet interface on unit for connection of operating controls for BAS control. Control shall allow for modulating heating via the gas-fired burner and modulating stages cooling, fan, and damper control. See section 23 09 93 for required data to be relayed to the BAS for monitoring and control.

C. Provide remote mounted fan control switch for smoke-purge for each unit (on-auto) to activate only the exhaust fan at each unit, keep the outdoor air damper closed, and de-engerize the energy wheel.

D. See Specification Section 230993 - Sequence Of Operations, for required operatiing capabilities of the units.

E. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135, BACnet MS/TP.

F. Control Valves: Field-installed, modulating, ball type with position tracking; see Section 25 35 19.

2.10 HEAT RECOVERY

A. The heat recovery module shall be provided as shown on the drawing and shall have a factory mounted and tested energy recovery wheel or solid-core heat exchanger as indicated in the schedule. If a wheel is noted, energy recovery wheel shall be mounted in a rigid frame containing the wheel drive motor, drive belt, wheel seats and bearings.

B. The energy recovery cassette shall be rated in accordance with ARI Standard 1060 and shall bear the ARI certification symbol.

C. The energy recovery cassette shall contain a total energy heat wheel or solid core constructed of a light weight polymer material with permanently bonded desiccant coating. The energy recovery section media shall be capable of removal from the unit and be cleanable using hot water or light detergent without degrading the latent efficiency.

D. Provide variable frequency drive on energy recovery wheel.

E. Provide bypass dampers for economizer function.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.or illustrated by the manufacturer.

B. Verify that proper power supply is available.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NFPA 90A.

C. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

D. Locate remote panels where identified in field coordination meeting.

E. Tie unit into BAS as specified.

F. All units are to be painted. Color to be selected by architect.

3.03 SYSTEM STARTUP

A. Prepare and start equipment. Adjust for proper operation.

3.04 CLOSEOUT ACTIVITIES

A. Demonstrate operation to Owner's maintenance personnel (minimum 8 hours)

3.05 MAINTENANCE

A. Provide service and maintenance of packaged roof top units for 2 years year from Date of Substantial Completion.

B. Provide routine maintenance service with a three month interval as maximum time period between calls.

C. Include maintenance items as outlined in manufacturer's operating and maintenance data, including minimum of six filter replacements, minimum of one fan belt replacement, and controls check-out, adjustments, and recalibration.

D. After each service call, submit copy of service call work order or report that includes description of work performed.

END OF SECTION

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SECTION 23 74 33
DEDICATED OUTDOOR AIR UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof-mounted DOAS with energy recovery.

1.02 RELATED REQUIREMENTS

A. Section 23 05 13 - Motor Requirements for HVAC and Plumbing Equip.

B. Section 23 05 48 - Vibration and Seismic Con. for Equipment.

C. Section 23 09 23 - Direct-Digital Control System for HVAC.

D. Section 23 09 34 - Variable-Frequency Motor Controllers for HVAC.

E. Section 23 33 00 - Air Duct Accessories: Flexible duct connections.

F. Section 25 14 00 - Integrated Automation Local Control Units.

G. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008, Including All Addenda.

B. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment; 2015.

C. ASHRAE Std 23.1 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Condensing Units that Operate at Subcritical Pressures of the Refrigerant; 2019.

D. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

G. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

H. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data with dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.

D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

E. Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

F. Operation And Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

G. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

H. Project Record Documents: Record actual locations of components.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements for additional provisions.

2. Extra Filters: One set of each type and size.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section with minimum 5 years of experience and approved by manufacturer.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturers warranty for compressor/condenser unit.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 ROOF-MOUNTED DOAS FABRICATION REQUIREMENTS

A. Packaged Unit:
   1. Casing and Components:
      a. Fabrication: AHRI 210/240 and UL 207 construction, ASHRAE Std 23.1 tested.
      b. 18 gauge, 0.0478 inch steel panels reinforced with structural angles and channels to ensure rigidity.
      c. Provide bolted access panels to access each sections from either side of unit.
      d. Provide hinged door with lockable handle for serviceable sections.
      e. Drain Pan: Galvanized steel with corrosion-resistant coating.
   2. Performance Ratings: ASHRAE Std 90.1 I-P, EER and COP as applicable.
   3. Regulatory Requirements: AHRI 270 rated, NFPA 70, and UL (DIR) listed.
   4. Insulation: Minimum 1/2 inch thick acoustic duct liner for lining cabinet interior.
   5. External Surface Finish: Heat resistant baked enamel.
   6. Outdoor Installation: Weatherproofed casing, with intake louver or hood.
   7. Outside Air Damper with Rain Hood and Screen:
      a. Dampers to modulate when unit is on economizer, space pressurization, or CO2 control.
   8. Suspended Installations: Service platforms complete with handrails and access ladder.

B. Filter Section:
   1. Filter: Removable, 4 inches thick MERV-13 on supply airstreams and MERV-8 on return/exhaust airstreams.
   2. Monitoring: Provide gauge with loaded setpoint-adjustable signal flag, or external tag. Provide loaded filter alarm switch wired into unit controls with illuminated indicator on local control panel face.

C. Heating Section (where indicated on schedules):
   1. Indirect Gas-Fired Furnace:
      a. Fully sealed natural gas burning assembly configured for modulated min. 5:1 turn down ratio using electrically operated devices including modulating main gas valve, shut down valve, main gas, and pilot gas regulators. Manual main gas shut-off valve and pilot adjustment valve.
      b. Insulation: Neoprene faced glass fiber insulation, 1 inch thick, on inlet components to burner profile plate.
      c. Observation Port: On burner section for observing main and pilot flames.
      d. Pilot: Electrically ignited by spark rod through high voltage ignition transformer.
      e. Damper: Motorized with end switch to prove position before burner will fire.

D. Enthalpy Economizer Section (where indicated on schedules): Provide factory installed sensors, electrically actuated return air damper, and electrically actuated exhaust damper fully coordinated with return, exhaust, or return-exhaust fan section. Configure controls for fault-detection diagnostics.

E. Energy Recovery Section: Provide solid-core plate-type energy recovery device fully coordinated with return, exhaust, or return-exhaust fan section.

F. Fan Section:
   1. Provide direct or plenum mounted variable-speed fan motors; see Section 23 05 13.
   2. Draw-through, backward-curved fan, constructed of corrosion-resistant, galvanized material and designed for efficient, quiet operation.
   3. Factory program for both soft start and constant flow output over static pressure range.
   4. Provide preinstalled neutral wire protection when required to support specified fan type.
   5. Motor to include thermal overload protection, quick disconnect plug, and permanently lubricated bearings.
   6. Belt-Driven Motor Requirements: Provide adjustable blower motor/sheave combination device based on indicated flow performance requirements. Statically and dynamically balanced centrifugal fan mounted on solid steel shaft with heavy duty self-aligning prelubricated ball bearings and V-belt drive with matching motor sheaves and belts.
   7. Variable Speed Control: Configure controller to maintain adjustable flow setpoint for modulating or speed-switched units; see Section 23 09 34.
   8. Fan Turndown: Design control features to allow fan speed reduction to adjustable 50 percent of its capacity when the zone set point temperature is satisfied or when unit runs in fan-only mode.

G. Unit Controls:
   1. DDC:
      a. Application Specific Controller; see Section 25 14 00 unless factory-provided.
      b. Tested to monitor and handle sequencing functions and other operational modes using field-mounted thermostat and other sensors.
      c. Coordination and Sequencing:
         1) Internal Devices: Include compressors, blower, sensors, switches, valves, safeties, other components.
         2) Field-Installed Devices: Solenoid valves, thermostat, EWT sensors, LWT sensors, internal and remote contacts, and other devices required for operation.
         3) Safeties: At minimum include anti-short-cycle compressor protection, condensate overflow, refrigerant high pressure, refrigerant low pressure, loss-of-charge, refrigerant freeze protection, and freezestat.

H. Electrical: 208 or 480 VAC, 3-phase (as scheduled), 60 Hz, single point to factory-mounted nonfused disconnect switch internally wired into motors and compressors, and other powered components including system safeties.

I.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in and provide startup services in accordance with manufacturer's instructions.

B. Provide owner training and demonstration of not less than 4 hours.

C. Provide unit- or duct-mounted smoke detectors and other NFPA 90A provisions.

D. Install unit on vibration isolator pad or roof curb; see Section 23 05 48.

E. Provide flexible duct connections on inlet and outlet from unit; see Section 23 33 00.

F. Connect drain pan outlet to nearest building drain system piping.

G. Adjusting: Use plenum static pressure readings against manufacturer calibration chart to adjust primary airflow as other measuring methods will not work.

H. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front-end interface.

3.02 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Provide service and maintenance of units for one year from Date of Substantial Completion.

END OF SECTION

SECTION 23 81 01
TERMINAL HEAT TRANSFER UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Baseboard radiation.

B. Unit heaters.

C. Cabinet unit heaters.

1.02 RELATED REQUIREMENTS

A. Section 23 05 13 - Motor Requirements for HVAC and Plumbing Equip.

B. Section 23 21 13 - Hydronic Piping.

C. Section 23 21 14 - Hydronic Specialties.

D. Section 23 09 93 - Sequence of Operations for HVAC Controls.

E. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections. Installation of room thermostats. Electrical supply to units.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide typical catalog of information including arrangements.

C. Shop Drawings:
   1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
   2. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
   3. Indicate mechanical and electrical service locations and requirements.,

D. Manufacturer's Instructions: Indicate installation instructions and recommendations.

E. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access or valving.

F. Operation and Maintenance Data: Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

G. Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum 5 years documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturers warranty for all motors.

C. Provide two year parts and labor warranty for entire unit, from substitute and completion.

PART 2 PRODUCTS

2.01 GAS UNIT HEATERS

A. Manufacturers:
   1. Trane Inc: www.trane.com/#sle.
   2. Rittling www.rittling.com .
   3. Modine.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Heat Exchanger: Stainless Steel.

C. Casing: 0.0478 inch steel with threaded pipe connections for hanger rods.

D. Finish: Factory applied baked enamel of color as selected.

E. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.

F. Air Outlet: Adjustable pattern diffuser on projection models and two or four way louvers as scheduled on horizontal throw models.

G. Motor: ECM Motor.

H. Control: Local multi-speed or via BAS, disconnect switch. See Sequence of Operations for ATC requirements.

I. Capacity: As scheduled.

2.02 ELECTRIC BASEBOARD

A. Manufacturers:
1. QMark.
2. Marley.
3. Trane.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Assembly: UL listed and labelled with terminal box and cover, and built-in controls.

C. Heating Elements: Enclosed copper tube, aluminum finned element of coiled nickel-chrome resistance wire centered in tubes and embedded in refractory material.

D. Enclosure: Minimum 0.030 inch steel with 7 inch high back and top of one piece; front panel, end panel, end caps, corners, and joiner pieces to snap together, and front panel easily removable. Provide full length damper.

E. Control: Electronic control system with baseboard mounted power module, baseboard mounted electronic thermostat.

2.03 ELECTRIC UNIT HEATERS AND ELECTRIC CABINET UNIT HEATERS

A. Manufacturers:
1. QMark.
2. Marley.
3. Trane.
4. Berko.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Assembly: UL listed and labelled assembly with terminal box and cover, and built-in controls. See sequence of operations for additional ATC requirements.

C. Heating Elements: Enclosed copper tube, aluminum finned element of coiled nickel-chrome resistance wire centered in tubes and embedded in refractory material or exposed helical coil of nickel chrome resistance wire refractory ceramic support bushings. .

D. Cabinet: 0.0478 inch steel with easily removed front panel with integral air outlet and inlet grilles.

E. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.

F. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard.

G. Motor: Permanently lubricated, sleeve bearings for horizontal models, ball bearings for vertical models.

H. Control: Separate fan speed switch and thermostat heat selector switch, factory wired, with switches built-in behind cover. Provide thermal overload.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Do not damage equipment or finishes.

C. Protection: Provide finished cabinet units with protective covers during balance of construction.

D. Baseboard Radiation: Locate on outside walls and run cover continuously wall-to-wall unless otherwise indicated. Center elements under windows. Install end caps where units butt against walls.

E. Unit Heaters: Hang from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

F. Cabinet Unit Heaters: Install as indicated. Coordinate to assure correct recess size for recessed units.

G. Install electric heating equipment including devices furnished by manufacturer but not factory-mounted. Furnish copy of manufacturer's wiring diagram submittal. Install electrical wiring in accordance with manufacturer's submittals and Section 26 27 17.

H. Provide Owner demonstration and training of not less than 4 hours.

3.02 CLEANING

A. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

C. Install new filters.

END OF SECTION

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SECTION 23 81 27
SMALL SPLIT-SYSTEM HEATING AND COOLING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air cooled condensing units.

B. Indoor ductless fan & coil units.

C. Controls.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Mounting pad for outdoor unit.

B. Section 22 10 05 - Plumbing Piping: Indoor coil condensate drain.

C. Section 23 09 13 - Instrumentation and Control Devices for HVAC: Thermostats, humidistats, time clocks.

D. Section 23 09 23 - Direct Digital Controls Systems for HVAC.

E. Section 23 09 93 - Sequence of Operations for HVAC.

F. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

1.03 REFERENCE STANDARDS

A. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment; 2015.

B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.

C. AHRI 610 (I-P) - Standard for Performance Rating of Central System Humidifiers for Residential Applications; 2014.

D. ASHRAE Std 15 - Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants ; 2019.

E. ASHRAE Std 23.1 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Condensing Units that Operate at Subcritical Pressures of the Refrigerant; 2019.

F. ASHRAE Std 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

G. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. ASHRAE Std 90.2 - Energy-Efficient Design of Low-Rise Residential Buildings; 2018, with Addendum (2023).

I. ASHRAE Std 103 - Method of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers; 2022.

J. NEMA MG 1 - Motors and Generators; 2014.

K. NFPA 31 - Standard for the Installation of Oil Burning Equipment; 2018.

L. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

M. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2018.

N. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; 2019.

O. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

D. Design Data: Indicate refrigerant pipe sizing.

E. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

F. Project Record Documents: Record actual locations of components and connections.

G. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

H. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 10 years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of documented experience and approved by manufacturer.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturers warranty for heat exchangers, condensing units, and compressors.

1.07 EXTRA MATERIALS

A. See Section 01 6000 - Project Requirements, for additional provisions.

B. Provide two filters for each indoor unit.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mitsubishi:

B. LG:

C. Daikin.

D. Samsung

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
   1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator .
   2. Cooling: Outdoor electric condensing unit with evaporator coil in central ducted indoor unit or coils in multiple .
   3. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

B. Performance Requirements: See Drawings for additional requirements.
   1. Efficiency: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than requirements of ASHRAE Std 90.1; seasonal efficiency to ASHRAE Std 103.

2.03 INDOOR UNITS FOR DUCTED SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
   1. Air Flow Configuration: Counterflow, with additional steel base; counterflow or horizontal as scheduled.
   2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.

B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
   1. Motor: NEMA MG 1; 1750 rpm single speed or multiple speed as scheduled permanently lubricated, hinge mounted.
   2. Motor Electrical Characteristics:

C. Air Filters: 1 inch thick glass fiber, disposable type arranged for easy replacement.

D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
   1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
   2. Manufacturers: System manufacturer.

2.04 INDOOR UNITS FOR DUCTLESS SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.

B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
   1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
   2. Manufacturer: System manufacturer.

2.05 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
   1. Refrigerant: R-454B.
   2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
   3. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23.1 and UL 207.

B. Compressor: As scheduled ARI 520; hermetic, single or two speed 1800 and 3600 rpm, resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.

C. Air Cooled Condenser: ARI 520; Aluminum fin and copper tube coil, with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
   1. Provide factory-applied marine / coastal-rated coating over entire coil and fin assembly approved for highly corrosive environments.

D. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line).
   1. Provide thermostatic expansion valves.
   2. Provide heat pump reversing valves.

E. Operating Controls:
   1. Control by room thermostat to maintain room temperature setting.

2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig and off when pressure drops below 140 psig for operation to 0 degrees F.

F. Mounting Pad: Minimum square; minimum of two located under cabinet feet.

2.06 ACCESSORY EQUIPMENT

A. Room Humidistat: Electric, adjustable, to energize humidifier when fan operating, to maintain setting.

B. Room Thermostat: Wall-mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
1. System selector switch (heat-off-cool) and fan control switch (auto-on).
2. Automatic switching from heating to cooling.
3. Preferential rate control to minimize overshoot and deviation from setpoint.
4. Set-up for four separate temperatures per day.
5. Instant override of setpoint for continuous or timed period from one hour to 31 days.
6. Short cycle protection.
7. Programming based on every day of the week.
8. Selection features including degree F or degree C display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.
9. Battery replacement without program loss.
10. Thermostat display:
    a. Time of day.
    b. Actual room temperature.
    c. Programmed temperature.
    d. Programmed time.
    e. Duration of timed override.
    f. Day of week.
    g. System mode indication: heating, cooling, fan auto, off, and on, auto or on, off.
11. Manufacturers:
    a. Matching unit manufacturer or provided by Building Automation System vendor..

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

C. Verify that proper fuel supply is available for connection.

D. Verify that water supply is available for humidifier.

3.02 INSTALLATION

A. Install and provide startup services in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

C. Provide vent connections in accordance with NFPA 211.

D. Install refrigeration systems in accordance with ASHRAE Std 15.

E. Mount counterflow furnaces installed on combustible floors on additive base.

F. Provide Owner training of not less than 2 hours.

END OF SECTION

SECTION 23 81 29

VARIABLE REFRIGERANT VOLUME (VRV, VRF) HVAC SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Variable refrigerant volume HVAC system includes:
   1. Outdoor/Condensing unit(s).
   2. Indoor/Evaporator units.
   3. Branch selector units.
   4. Refrigerant piping.
   5. Control panels.
   6. Control wiring.

1.02 RELATED REQUIREMENTS

A. Section 01 23 00 - Alternates: List of alternates relevant to this section.

B. Section 01 79 00 - Demonstration and Training.

C. Section 22 10 05 - Plumbing Piping: Condensate drain piping.

D. Section 22 30 00 - Plumbing Equipment: Cooling condensate removal pumps.

E. Section 23 08 00 - Commissioning of HVAC.

F. Section 23 23 00 - Refrigerant Piping and Specialties: Additional requirements for refrigerant piping system.

G. Section 26 27 17 - Equipment Wiring: Power connections to equipment.
   1. Provide separate power connections for each unit of equipment.

H. Section 23 09 23 and 23 09 93: Building automation system providing centralized control of this system.

I. Section 01 91 00 - Commissioning

J. Section 01 91 10 - Functional Testing Procedures

K. Section 23 08 00 - Mechanical Systems Commissioning

L. Section 23 08 10 - Control Systems Commissioning

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008, Including All Addenda.

B. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Pre-Bid Submittals: For proposed substitute systems/products, as defined in PART 2, and alternate systems/products, as defined above, proposer shall submit all data described in this article, under the terms given for substitutions stated in PART 2.

C. Design Data:
   1. Provide design calculations showing that system will achieve performance specified.
   2. Provide design data required by ASHRAE 90.1.

D. Product Data: Submit manufacturer's standard data sheets showing the following for each item of equipment, marked to correlate to equipment item markings shown in the contract documents:
   1. Control Panels: Complete description of options, control points, zones/groups.

E. Specimen Warranty: Copy of manufacturer's warranties.

F. Shop Drawings: Installation drawings custom-made for this project; include as-designed HVAC layouts, locations of equipment items, refrigerant piping sizes, lengths, and locations, condensate piping sizes and locations, remote sensing devices, control components, electrical connections, control wiring connections. Include:
   1. Detailed piping diagrams, with branch balancing/selector devices.
   2. Condensate piping routing, size, and pump connections.
   3. Detailed power wiring diagrams.
   4. Detailed control wiring diagrams.
   5. Locations of required access through fixed construction.
   6. Drawings required by manufacturer.

G. Operating and Maintenance Data:
   1. Manufacturer's complete standard instructions for each unit of equipment and control panel.
   2. Custom-prepared system operation, troubleshooting, and maintenance instructions and recommendations.
   3. Identification of replaceable parts and local source of supply.

H. Project Record Documents: Record the following:
   1. As-installed routing of refrigerant piping and condensate piping.
   2. Locations of access panels.
   3. Locations of control panels.

I. Warranty: Executed warranty, made out in Owner's name.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Company that has been manufacturing variable refrigerant volume heat pump equipment for at least 5 years.
   2. Company that provides system design software to installers.

B. Installer Qualifications: Trained and approved by manufacturer of equipment.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle equipment and refrigerant piping according to manufacturer's recommendations.

1.08 EXTRA MATERIALS

A. Provide 2-piece filter assemblies for indoor ducted units.

B. Provide two (2) spare filter sets for each indoor unit.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Compressors: Provide manufacturer's warranty for six (6) years from date of installation. During the stated period, should any part fail due to defects in material and workmanship, it shall be repaired or replaced by the manufacturer. All warranty service work shall be preformed by a factory trained service professional.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: The system design shown in the contract documents is based on equipment and system designed by Samsung.

B. Additional acceptable manufacturers:
   1. Daikin.
   2. Mitsubishi/Trane
   3. LG.

C. For systems proposed by other manufacturers other than the basis of design, Samsung, all required modifications to the design and installation shall be the responsibility of the contractor and supplier for both costs and coordination with all other contractors and designers. These changes include, but are not limited to:
   1. Changes in refrigerant piping sizes, legnhts, and locations.
   2. Changes in branch selector quantities, locations, and accessibility.
   3. Changes in electrical requirements, including all power wiring, terminations, breakers, disconnects, and control wiring.
      a. UNDER NO CIRCUMSTANCES MAY BLOWER COIL OR FAN COIL TERMINAL UNITS BE GROUPED TOGETHER ON THE SAME ELECTRICAL CIRCUIT. All units must maintain a dedicated circuit to each.
   4. Changes in heat-pump unit locations and quantities.
   5. Changes in structural supports, vibration isolation, and hangers.
   6. Changes to the drawings to reflect the new system parameters.

2.02 HVAC SYSTEM DESIGN

A. System Operation: Heating and cooling, simultaneously.
   1. Zoning: Provide capability for temperature control for each individual indoor/evaporator unit independently of all other units.
   2. Zoning: Provide heating/cooling selection for each individual indoor/evaporator unit independently of all other units.
   3. Provide a complete functional system that achieves the specified performance based on the specified design conditions and that is designed and constructed according to the equipment manufacturer's requirements.
   4. Conditioned spaces are shown on drawings.
   5. Branch selector unit locations are shown on the drawings for reference only. Final design locations shall be corrdinated in the field to ensure optimized line lengths and maintanence access.
   6. Required equipment unit capacities are shown on the drawings.
   7. Refrigerant piping sizes shown on the drawings are for general reference only. Final line sizing shall be the responsibility of the successful contractor and manufacturer.
   8. Connect equipment to condensate piping; condensate piping is shown on the drawings.

B. Cooling Mode Interior Design Performance:
   1. Daytime Setpoint: 75 degrees F, plus or minus 2 degrees F.
   2. Setpoint Range: 57 degrees F to 80 degrees F.
   3. Night Setback: 78 degrees F.
   4. Interior Relative Humidity: 50 percent, maximum.

C. Heating Mode Interior Design Performance:
   1. Daytime Setpoint: 70 degrees F, plus or minus 2 degrees F.
   2. Setpoint Range: 59 degrees F to 76 degrees F.
   3. Night Setback: 60 degrees F.
   4. Interior Relative Humidity: 20 percent, minimum.

D. Outside Air Design Conditions:
   1. Summer Outside Air Design Temperature: 0.4 percent cooling design condition listed in ASHRAE Fundamentals Handbook.

E. Operating Temperature Ranges:
   1. Simultaneous Heating and Cooling Operating Range: minus 4 degrees F to 60 degrees F dry bulb.
   2. Cooling Mode Operating Range: minus 4 degrees F to 110 degrees F dry bulb.
   3. Heating Mode Operating Range: 0 degrees F to 77 degrees F dry bulb; minus 4 degrees F to 60 degrees F wet bulb; without low ambient controls or auxiliary heat source.

F. Controls: Provide the following control interfaces:
   1. For Each Indoor/Evaporator Unit: One wall-mounted wired "local" controller, with temperature sensor; locate where directed, in each space.
      a. Where two or more units are used to condition the same space, provide a splitter or twinning kit to allow for multiple unit control from a single controller.
   2. One central remote control panel for entire system; locate where indicated.
   3. BACNet gateways sufficient to connect all units to building automation system by others; include wiring to gateways. Unit shall be BTL certified.
   4. Building automation system by HVAC system manufacturer ; provide one user stations located where indicated.

G. Local Controllers: Mount units above ceiling for use with remote, flat-plate temerpature sensors. Units shall be wired, and provide local setpoint adjustment (with central control override, maximum temperature adjustment), and temperature display for trouble-shooting.

H. Remote Temperature Sensors: Provide wall-mounted, flush-mount flat-plate style RTD temperatuer sensors located in the same room for all units. For rooms with multiple units, provide twinning kits for simlutaneous control.

2.03 EQUIPMENT

A. All Units: Factory assembled, wired, and piped and factory tested for function and safety.
   1. Refrigerant: R-32 or R-454B.
   2. Performance Certification: AHRI Certified; www.ahrinet.org.
   3. Safety Certification: Tested to UL 1995 by UL or Intertek-ETL and bearing the certification label.
   4. Provide outdoor/condensing units capable of serving indoor unit capacity up to 200 percent of the capacity of the outdoor/condensing unit.
   5. Provide units capable of serving the zones indicated.
   6. Thermal Performance: Provide heating and cooling capacity as indicated, based on the following nominal operating conditions:
   7. Energy Efficiency: Report EER and COP based on tests conducted at “full load” in accordance with AHRI 210/240 or alternate test method approved by U.S. Department of Energy.
   8. All units to include mandatory room-level refrigerant monitoring system and emergency isolation valves as required by code.

B. Electrical Characteristics:
   1. See drawings.

C. System Controls:
   1. Include self diagnostic, auto-check functions to detect malfunctions and display the type and location.

D. Unit Controls: As required to perform input functions necessary to operate system; provided by manufacturer of units.
   1. Provide interfaces to remote control and building automation systems in BACNET native format.
   2. Room-level controls to be globally adjustable, screen lockout from local controls as selected by Owner.
   3. Unit controls shall incorporate refrigerant monitoring system tied to emergency isolation solenoid valve as required by code.

E. Wiring:
   1. Control Wiring: 18 AWG, 2-conductor, non-shielded, non-polarized, stranded cable.
   2. Control Wiring Configuration: Daisy chain.
   3. All control wiring for the VRF system in it's entirety is the responsbility of the installing contractor, including, but not limited to: Wiring between the condensing unit(s) and system controller, wiring between the branch selector boxes and system controller, wiring from the terminal units to the system controllers, wiring from the thermostats to the terminal units. The BAS contractor shall only be required to provide communications wiring to the BACnet interface from the nearest BAS controller.

F. Refrigerant Piping:
   1. Provide three-pipe refrigerant system, including high/low pressure dedicated hot gas, liquid and suction lines; two-pipe systems utilizing lower temperature mixed liquid/gas refrigerant to perform heat recovery are not permitted due to reduced heating capabilities.
   2. Refrigerant Flow Balancing: Provide refrigerant piping joints and headers specifically designed to ensure proper refrigerant balance and flow for optimum system capacity and performance.
   3. Only rigid / drawn ACR piping may be used on this project except at the final connection to the air handler/indoor head unit.
   4. Insulate each refrigerant line individually between the condensing and indoor units.

2.04 OUTDOOR/CONDENSING UNITS

A. Outdoor/Condensing Units: Air-cooled DX refrigeration units, designed specifically for use with indoor/evaporator units; factory assembled and wired with all necessary electronic and refrigerant controls; modular design for ganging multiple units.
   1. Refrigeration Circuit: Scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant regulator.
   2. Refrigerant: Factory charged.
   3. Variable Volume Control: Modulate compressor capacity automatically to maintain constant suction and condensing pressures while varying refrigerant volume to suit heating/cooling loads.
   4. Capable of being installed with wiring and piping to the left, right, rear or bottom.
   5. Capable of heating operation at low end of operating range as specified, without additional low ambient controls or auxiliary heat source; during heating operation, reverse cycle (cooling mode) oil return or defrost is not permitted, due to potential reduction in space temperature.
   6. Sound Pressure Level: As specified, measured at 3 feet from front of unit; provide night setback sound control as a standard feature; three selectable sound level steps of 55 dB, 50 dB, and 45 dB, maximum.
   7. Power Failure Mode: Automatically restart operation after power failure without loss of programmed settings.
   8. Safety Devices: High pressure sensor and switch, low pressure sensor/switch, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
   9. Provide refrigerant sub-cooling to ensure the liquid refrigerant does not flash when supplying to us indoor units.
   10. Oil Recovery Cycle: Automatic, occurring 2 hours after start of operation and then every 8 hours of operation; maintain continuous heating during oil return operation.
   11. Controls: Provide contacts for electrical demand shedding.

B. Unit Cabinet: Weatherproof and corrosion resistant; rust-proofed mild steel panels coated with baked enamel finish.
   1. Designed to allow side-by-side installation with minimum spacing.

C. Fans: One or more direct-drive propeller type, vertical discharge, with multiple speed operation via DC (digitally commutating) inverter.
   1. Provide minimum of 2 fans for each condensing unit.
   2. External Static Pressure: Factory set at 0.12 in WG, minimum.
   3. Indoor Mounted Air-Cooled Units: External static pressure field set at 0.32 in WG, minimum; provide for mounting of field-installed ducts.
   4. Fan Airflow: As indicated for specific equipment.
   5. Fan Motors: Factory installed; permanently lubricated bearings; inherent protection; fan guard; output as indicated for specific equipment.

D. Condenser Coils: Copper tubes expanded into aluminum fins to form mechanical bond; waffle louver fin and rifled bore tube design to ensure high efficiency performance.
   1. Provide factory-applied marine / coastal-rated coating over entire coil and fin assembly, approved for highly corrosive environments.

E. Compressors: Scroll type, hermetically sealed, variable speed inverter-driven and fixed speed in combination to suit total capacity; minimum of one variable speed, inverter driven compressor per condenser unit; minimum of two compressors per condenser unit; capable of controlling capacity within range of 6 percent to 100 percent of total capacity.
   1. Multiple Condenser Modules: Balance total operation hours of compressors by means of duty cycling function, providing for sequential starting of each module at each start/stop cycle, completion of oil return, and completion of defrost, or every 8 hours. Provide twinning kits where required.
   2. Failure Mode: In the event of compressor failure, operate remaining compressor(s) at proportionally reduced capacity; provide microprocessor and associated controls specifically designed to address this condition.
   3. Provide each compressor with crankcase heater, high pressure safety switch, and internal thermal overload protector.
   4. Provide oil separators and intelligent oil management system.
   5. Provide spring mounted vibration isolators.

2.05 BRANCH SELECTOR UNITS

A. Branch Selector Units: Concealed boxes designed specifically for this type of system to control heating/cooling mode selection of downstream units; consisting of electronic expansion valves, subcooling heat exchanger, refrigerant control piping and electronics to facilitate communications between unit and main processor and between branch unit and indoor/evaporator units.
   1. Provide one electronic expansion valve for each downstream unit served, except multiple indoor/evaporator units may be connected, provided balancing joints are used in downstream piping and total capacity is within capacity range of the branch selector.
   2. When branch unit is simultaneously heating and cooling, energize subcooling heat exchanger.
   3. Casing: Galvanized steel sheet; with flame and heat resistant foamed polyethylene sound and thermal insulation.
   4. Refrigerant Connections: Braze type, with isolation valve upstream of BSU.
   5. Condensate Drainage: Provide condensate drain tap where required.

2.06 INDOOR/EVAPORATOR UNITS

A. All Indoor/Evaporator Units: Factory assembled and tested DX fan-coil units, with electronic proportional expansion valve, control circuit board, factory wiring and piping, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
   1. Refrigerant: Refrigerant circuits factory-charged with dehydrated air, for field charging.
   2. Temperature Control Mechanism: Return air thermistor and computerized Proportional-Integral-Derivative (PID) control of superheat.
   3. Dehumidification Function: On command.

4. Coils: Direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond; waffle louver fin and high heat exchange, rifled bore tube design; factory tested.
   a. Provide thermistor on liquid and gas lines.
5. Fans: Direct-drive, with statically and dynamically balanced impellers; high and low speeds unless otherwise indicated; motor thermally protected.
6. Return Air Filter: High efficiency, MERV 13
7. Condensate Drainage: Built-in condensate drain pan with PVC drain connection.
8. Cabinet Insulation: Sound absorbing foamed polystyrene and polyethylene insulation.

B. Recessed Ceiling Units: Four-way airflow cassette with central return air grille, for installation in a fixed ceiling.
   1. Cabinet Height: Maximum of 10 inches above face of ceiling.
   2. Exposed Housing: White, impact resistant, with washable decoration panel.
   3. Supply Airflow Adjustment:
      a. Via motorized louvers which can be horizontally and vertically adjusted from 0 to 90 degrees.
      b. Field-modifiable to 3-way and 2-way airflow.
      c. Three auto-swing positions, including standard, draft prevention and ceiling stain prevention.
   4. Return Air Filter: High efficiency,MERV 13.
   5. Minimum Capacity: As indicated on drawings.
   6. Sound Pressure Range: Between 28 dB(A) to 33 dB(A) at low speed measured at 5 feet below the unit.
   7. Fan: Direct-drive turbo type, with motor output range of 0.06 to 0.12 HP.
   8. Condensate Pump: Built-in, with lift of 21 inches, minimum.
   9. Provide side-mounted fresh air intake duct connection.

C. Concealed-In-Ceiling Units: Ducted horizontal discharge and return; galvanized steel cabinet.
   1. Return Air Filter: MERV 11.
   2. Sound Pressure: Measured at low speed at 5 feet below unit.
   3. Provide external static pressure switch adjustable for high efficiency filter operation
   4. Condensate Pump: Built-in, with lift of 9 inches, minimum.
   5. Switch box accessible from side or bottom.

D. Wall Surface-Mounted Units: Finished white casing, with removable front grille; foamed polystyrene and polyethylene sound insulation; wall mounting plate; polystyrene condensate drain pan.
   1. Airflow Control: Auto-swing louver that closes automatically when unit stops; five (5) steps of discharge angle, set using remote controller; upon restart, discharge angle defaulting to same angle as previous operation.
   2. Sound Pressure Range: Measured at low speed at 3.3 feet below and away from unit.
   3. Condensate Drain Connection: Side (end), not concealed in wall.
   4. Fan: Direct-drive cross-flow type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that required electrical services have been installed and are in the proper locations prior to starting installation.

B. Verify that condensate piping has been installed and is in the proper location prior to starting installation.

C. Notify Architect if conditions for installation are unsatisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install refrigerant piping in accordance with equipment manufacturer's instructions.

C. Perform wiring in accordance with NFPA 70, National Electric Code (NEC).

D. Coordinate with installers of systems and equipment connecting to this system.

3.03 FIELD QUALITY CONTROL

A. Provide manufacturer's field representative to inspect installation prior to startup.

3.04 SYSTEM STARTUP

A. Provide manufacturer's field representative to perform system startup.

B. Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.

C. Adjust equipment for proper operation within manufacturer's published tolerances.

3.05 CLEANING

A. Clean exposed components of dirt, finger marks, and other disfigurements.

3.06 CLOSEOUT ACTIVITIES

A. Demonstrate proper operation of equipment to Owner's designated representative.

B. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Briefly describe function, operation, and maintenance of each component.

C. Training: Train Owner's personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.
   3. Instructor: Manufacturer's training personnel.
   4. Location: At project site.

3.07 PROTECTION

A. Protect installed components from subsequent construction operations.

B. Replace exposed components broken or otherwise damaged beyond repair.

3.08 MAINTENANCE

A. See Section 01 70 00 - Execution Requirements, for additional requirements relating to maintenance service.

END OF SECTION

SECTION 23 84 19
INDOOR POOL DEHUMIDIFICATION UNITS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Furnish and install where indicated, factory-assembled, outdoor swimming pool heat pump dehumidification system. System shall include compressor(s), evaporator coil(s), air side condenser reheat coil(s), supply fan, air control dampers, auxiliary heating capability, moisture disposal, complete solid state logic control system, factory-installed and wired in a single unit enclosure.

B. The unit shall be specifically designed, manufactured and tested for enclosed swimming pool duty. Field-assembled or modified, standard, commercial grade equipment is not acceptable. Complete unit shall be suitable for indoor or outdoor, weatherproof mounting.

C. The complete unit shall be listed by an industry recognized, third-party, safety code agency under the title of “Special Purpose Air Conditioners” and carry the appropriate label.

D. Manufacturer shall have a minimum of ten years prior experience making similar equipment as described in this specification.

1.02 INTENT

A. It is the intent of this section of the specifications to provide a complete, operable, adjusted natatorium dehumidification system as shown and scheduled on the plans.

1.03 MANUFACTURER

A. Basis of Design: PoolPak LLC - PoolPak® PCP-3500-RL-X

B. Desert Air

C. Dectron

PART 2 - PRODUCT

2.01 PRINCIPLE OF OPERATION

A. The unit shall control space temperature and relative humidity, pool water temperature and shall provide ventilation. Warm moist air from the natatorium is drawn over the evaporator coil by the return fan and latent and sensible heat is removed from the air. The heat captured by this process and the heat generated from the compressor power consumption are absorbed by a mechanical refrigeration system.

B. The code required amount of ventilation air is introduced between the evaporator and reheat condenser. The mixed air is drawn over a reheat condenser coil and auxiliary heating coil by the supply fan.

C. The refrigeration system may be activated if any of the following occur:
   1. Space temperature drops below the set point
   2. Space relative humidity rises above the set point
   3. Space temperature rises above the set point

D. The unit shall monitor space and outside air temperature, space relative humidity, pool water temperature and building surface temperature.

E. The thermal energy absorbed by the refrigeration system is distributed as follows:
   1. First priority is given to maintaining the natatorium space temperature. No supplementary space heating system external to the unit is required.
   2. All heat is then transferred to a remote air-cooled condenser.

2.02 SCOPE

A. Furnish and install, where indicated, a factory-assembled, fully-enclosed, packaged environmental control system with energy recovery feature(s) designed for natatorium environment control

B. Features shall include:

1. Dehumidification by means of a direct expansion evaporator coil
2. Space heating by means of a packaged indirect-fired natural gas duct furnace module
3. Cooling mode with heat rejection to a packaged outdoor air cooled condenser
4. Packaged minimum exhaust fan
5. Integral minimum outdoor air connection
6. Internet connectivity for 2 years via cell based technology

C. Quality and Safety Assurance
1. The system shall be ETL listed
2. The system shall be completely assembled, wired, piped, and test-run at the factory prior to shipping. All controls shall be factory adjusted to satisfy the design conditions.
3. Manufacturer shall have a minimum of ten-plus years prior experience making similar equipment as described in this specification
4. Wherever possible, the system shall have a mechanical vestibule where the electrical panel, compressor(s), pool water heat exchanger(s), receiver(s) and most of the refrigeration controls are out of the process air stream
5. The system shall have a microprocessor controller with unit-mounted refrigerant pressure transducers on each refrigeration circuit, multiple temperature sensors and an Ethernet connection for factory logging and parameter adjustment via the Internet. The refrigerant pressure transducers shall be actively used for system control. The customer (or their authorized representative) shall be provided access to the online logging and parameter adjustment interface, upon request.
6. Demonstration of these capabilities must be carried out at the engineer's office prior to bid day
7. The system shall have remote factory start-up assistance capability, when connected to a network with Internet access
8. The system shall have 24-7 remote computer logging capability with automated alarm notifications and system performance alerts transmitted via e-mail to authorized users, when connected to a network with Internet access
9. Warranty: The entire system shall have a 24-month limited parts warranty from the factory ship date
    a. A 1-year labor warranty shall be provided by the manufacturer when the system is connected to the factory via an Internet monitoring system from the date of initial commissioning
    b. The compressor(s) shall have a 5-year warranty from the factory ship date
    c. The internal airside heat exchanger coils shall have a 5-year warranty from the factory ship date
    d. The drive line shall have a 5-year warranty from the factory ship date
10. When connected to a network with Internet access, the system shall have remote service capability with the ability for fieldservice technicians to receive service and trouble alerts by e-mail and make parameter adjustments via a browser interface on any Internet-capable device

2.03 PRODUCT

A. The natatorium control system shall include:
1. Mechanical process dehumidification
2. Outdoor cabinet configuration
3. Packaged outdoor air-cooled condenser for AC heat rejection
4. A packaged indirect-fired natural gas duct furnace module installed downstream of the blower, sized as specified by the design engineer to meet the skin losses and outdoor air heating loads
5. Air filtration via MERV-13 pleated panel filters for return
6. Minimum outdoor air connection
7. Minimum exhaust fan(s)
8. Programmable microprocessor controller with remote Internet logging and parameter adjustment

9. Remote operator panel(s)
10. A service vestibule where the compressor, refrigeration specialties, control valves and all electronics are outside of process air stream

B. Sequence of Operation
   1. The system shall be designed and sized to maintain the specified space conditions
      a. System Startup
         1) Power is turned on or the system is restarted
         2) After a short initial delay to allow the sensors to stabilize, the blower starts and operates continuously
         3) Based on sensor feedback, the system shall begin or resume operation based on the sequence below
      b. Airside Configuration
         1) The system continuously delivers the specified supply air volume to the natatorium
         2) The minimum exhaust air volume is set to meet the engineer's schedule.
         3) The minimum outdoor air volume is set to meet the engineer's schedule.
      c. Dehumidification Mode
         1) The return air relative humidity is above the humidity setpoint
         2) Return air dewpoint is above dewpoint setpoint.
         3) The compressor enters the Compressor Start sequence
         4) Initially, 100% of compressor hot gas discharge will be diverted to condense at the air reheat coil. The supply air temperature will be higher than the return air temperature
      d. Air Conditioning Mode
         1) The return air temperature is above the room temperature setpoint
         2) The compressor starts, if not already operating in Dehumidification Mode
         3) Excess compressor hot gas is diverted to the outdoor air cooled condenser for up to 100% heat rejection at summer design ambient conditions
      e. Space Heating Mode
         1) The return air temperature is below the room temperature setpoint
         2) The microprocessor space heating output signal (0-10 volts) is sent to the heating coil controller. The signal output will regulate based on the return air temperature
      f. Freeze Protection
         1) The supply air temperature falls below the freezestat setpoint
         2) Exhaust fan(s) are stopped and outdoor air damper(s) are fully closed
         3) When the freezestat alarm is tripped, it must be manually cleared by the operator

C. Cabinet
   1. Cabinet Construction: All cabinet 16, 20 and 24 gauge sheet metal shall be galvanized G90 steel or GalvalumeTM alloywith mill-applied zinc phosphate primer followed by an exterior grade white silicone modified polyester top coat. The sheet metal is engineered to form a cabinet with maximum strength and rigidity. All seams shall be caulked with silicone to prevent air and water leakage or infiltration
   2. Base Rails: The cabinet shall have a base frame comprised of 2 layers of 10 gauge mill galvanized G90 steel. Lifting lugs shall be provided on the base frame for rigging the system.
   3. The cabinet walls shall be of double-wall construction using 20 gauge pre-painted steel with a fully painted inner metal liner and 2 inches of fiberglass insulation
   4. The cabinet floor shall be of 2-inch double-wall construction using 20-gauge pre-painted steel engineered with structural bends for maximum rigidity, mechanically fastened to the base frame
   5. The cabinet roof shall be 20-gauge pre-painted steel, 2-inch double wall engineered with structural bending for maximum rigidity and be mechanically fastened to the base walls of the unit

6. The cabinets shall be mechanically assembled with stainless steel 5/32" sealed blind rivets. Where bolts are required bright zinc plated bolts shall be used
7. Access doors shall be supported on multiple hinges, held shut by compression latches for quick access. Doors shall be provided for entrance to all sections housing components requiring routine maintenance. Full height access doors shall have "hold back" latches to prevent door closure during the performance of service procedures
8. The unit shall have non-corroding protective mesh screens on all air intake openings

D. Outdoor Air Intake:
1. Minimum Outdoor Air connection: motorized damper, filter and time clock

E. Insulation: The unit shall be insulated per the following standards:
1. All exterior cabinet sections shall be insulated with two (2) inch thick fiberglass inside the double walled cabinet
2. Fire resistant rating to conform to NFPA Standard 90A and 90B
3. Sound attenuation coefficient shall not be less than 1.02 at a frequency of 1,000 Hz as per ASTM Standard C423
4. Thermal conductivity shall not exceed 0.26 Btu/hr-sqft-ft at 75 °F

F. Cabinet configuration shall include:
1. A filter rack with separate access doors shall be provided for the return air and minimum outdoor air streams
2. Unit shall be equipped with duct collars to admit the minimum outdoor air as scheduled. The outdoor air intake assembly shall have a built in air filter rack with separate access door, manual air balancing device and motorized 2 position extruded aluminum, Insulated, silicone side-sealed damper operated by 24-hour time clock
3. Mechanical vestibule: The unit shall have the compressor, receiver, solenoid valves and the electrical panel in a separate compartment out of the processed air stream. All components shall be serviceable while the unit is in operation without disturbing the airflow
4. Electrical panel: The unit shall have a built-in electrical control panel in a separate compartment in order not to disturb the airflow within the dehumidifier during electrical servicing. All electrical components shall be mounted on a 16 gauge galvanized sub-panel

G. Filters
1. Wherever possible, air filters shall be standard sized, replaceable, off-the-shelf filters including:
2. Return Air: 2-Inch MERV 13, 90% pleated filters with rust-free non-metallic structure on a slide-in or face-loading rack
3. Outside Air: 2-Inch MERV 13, 90% pleated filters with rust-free non-metallic structure.
4. Dirty air filter switches included on the return air filter for indicating an alarm when pressure drop exceeds a set point.

H. Coils
1. Evaporator/dehumidifier coils shall be designed for maximum moisture removal capacity
2. Coils shall be fully dipped and coated with a polyester/enamel coating for maximum corrosion protection. Coating shall comply with ASTM B117/D1654 and ASTM D2126 for corrosion resistance against common acids, salt and gases
3. Coil shall have galvanized casing and end plates
4. Aluminum fin and copper tubes mechanically bonded to assure high heat transfer.
5. Coils shall have a 3-year warranty extension for a total of 5 years coverage

I. Drain Pans
1. Each evaporator coil shall be provided with a positive draining, compound-sloped, baked powder paint coated aluminum drain pan with fully-welded corners to ensure zero water retention. In no way will stainless steel or galvanized drain pans be acceptable

J. Blowers and Blower Motors
1. Supply blowers:

a. Supply Blower shall consist of a steel backward airfoil; a three phase, enhanced performance cast aluminum, premium efficient NEMA design motor; and a general purpose, variable frequency drive (VFD)
b. The impeller and motor shall both have a corrosion resistant coating.
c. Each fan assembly shall be suitable for a maximum temperature of 121°F.
d. The supply blower will allow for fans to reduce speed in unoccupied hours saving operating costs.
e. Machines without this built-in supply fan array with redundancy and operating costs shall not be accepted.

2. Exhaust blowers:
   a. The packaged exhaust blower (EF1) shall be sized to maintain the negative pressure requirement in the space during normal operation and its operation tied to the system's occupancy scheduler
   b. The blower shall be impeller plenum fan complete with backward curved, three-dimensional, profiled blades made of high performance composite material. The blower shall be completely corrosion resistant and be maintenance free a direct drive via a direct current (DC) electronic commuted (EC) motor. The EC-Motor shall have zero slippage design and have continuously variable speed control when connected to the unit's controller. Fans that are not direct drive or EC are not acceptable.
   c. The fan assembly shall be balanced in Class G 6.3 acc DIN ISO 1940, dynamic on two levels
   d. The fan assembly shall be suitable for ambient temperatures of -40°C to max. +70°C
   e. Thermal contacts installed in the windings compliant with THCL 155
   f. Drive motor in external rotor principle, sealed in protection class IP54 with moisture protection impregnation of the windings, topical protection
   g. High corrosion resistance design with high quality and reliability
   h. The exhaust fan shall be controlled from an end switch on the power open of the exhaust air damper. The exhaust dampers shall be protected by louvers to divert rain from the face of the dampers

K. Dampers
   1. Internal dampers shall be made from extruded anodized aluminum with a parallel blade configuration and neoprene double-seal tips to minimize leakage. Damper blades shall be mounted on steel rods which rotate on nylon bushings. All damper hardware shall be corrosion resistant
   2. The system shall be provided with normally closed outside air and exhaust air dampers equipped with spring-return actuators The dampers adjust between 0% to 100% open position.
   3. The outdoor air and exhaust air dampers shall be of opposed blade configuration. Dampers shall have 0.750-inch insulated blades made from extruded anodized aluminum with neoprene double-seal tips to minimize leakage. Damper leakage shall be less than 1% of maximum flow at 4-inch water column differential. Damper blades shall be mounted on steel rods which rotate on nylon bushings. All damper hardware shall be corrosion resistant

L. Compressors
   1. Hermetic, scroll action compressor, suction gas cooled, suitable for refrigerant R-410A
   2. The compressor(s) shall be equipped with an internal solid-state thermal protection sensor
   3. Access: Service access valves for convenient servicing.
   4. The compressor(s) shall be mounted on rubber-in-shear isolators to limit the transmission of noise and vibration
   5. The compressor(s) shall be equipped with removable crankcase heater(s) for liquid migration protection
   6. The compressor(s) shall be located outside the conditioned air stream in the system's service vestibule
   7. Compressors shall have a 3-year warranty extension for a total of 5 years coverage

8. The compressor manufacturer must have a wholesale outlet for replacement parts in the nearest major city

M. Refrigeration Circuit
1. The system shall consist of one factory-sealed refrigeration circuit for dehumidification and sensible cooling. No site refrigeration work shall be required
2. Each refrigeration circuit shall have pressure transducers monitoring the refrigerant discharge (high) and suction (low)
3. pressures. The refrigeration circuit shall be accessible for diagnostics, adjustment and servicing without the need for service manifold gauges
4. All refrigeration circuits shall have refrigerant control valves, a liquid line filter-drier, a liquid and moisture indicator, an expansion valve, head pressure control feature and pump down feature
5. All refrigeration circuits shall have an electronic expansion valve
6. The system shall have an externally adjustable balanced port design mechanical thermostatic expansion valve. The valve shall have a removable power head
7. Tamper proof, hermetically sealed non-adjustable high and low pressure switches and refrigeration service valves shall be installed using Schrader type valves. Refrigeration service valves shall be located outside of the airstream
8. The suction line shall be fully insulated with 0.500-inch closed cell insulation

N. Control Panel
1. The electrical contractor shall be responsible for external power wiring and disconnect switch fusing. Power block terminals shall be provided
2. The system shall include a factory-installed non-fused disconnect
3. Main control panel shall be mounted inside the service vestibule outside of the process air stream
4. Blower motors shall be protected with thermal trip overloads
5. The system shall have a voltage monitor with phase protection
6. Available dry contacts shall include:
    a. Alarm
    b. Blower interlock
    c. Stage 1 & 2 heating
    d. Outdoor air damper control
    e. Remote exhaust fan #1
    f. Remote exhaust fan #2
    g. Outdoor-air cooled equipment
    h. System on
    i. Heat recovery
7. Terminals shall be provided to send 24-volt power to the outdoor air cooled condenser or fluid cooler fan contactor
8. All wiring shall be installed in accordance with UL or CSA safety electrical code regulations and shall be in accordance with the NFPA All components used in the system shall be UL or CSA listed
9. Wiring diagrams shall be located near the electrical panel(s) on the system. These diagrams shall provide colour-coding
10. and wire numbering for easy troubleshooting. All wires shall be contained in a wire duct.
11. The compressor(s) shall have a time delay on start to prevent short cycling
12. Pressure transducers for measuring refrigerant discharge (high) pressure and suction (low) pressure shall be provided.
13. An airflow switch and a dry contact for alarm(s) shall be provided and factory-mounted.

O. Microprocessor Control
1. A microprocessor controller with the following characteristics will be provided:
    a. All set points and parameter adjustments are pre-programmed at the factory during quality control testing
    b. The microprocessor program shall be stored on updatable FLASH memory

c. A minimum of 11 analogue inputs, 4 analogue outputs, 24 digital inputs and 16 digital outputs
d. Four serial interface ports including both RS232 and RS485 types
e. An Ethernet port with RJ-45 connector and LED activity indicator
f. A real time clock to time-stamp the system operation log and to enable a programmable 7-day occupation schedule
g. Two manual demand forced modes to allow the user to manually bypass the microprocessor in the event of controller failure
h. The local and remote operator panel(s) shall have a backlit graphic liquid crystal display with touch controls

2. The system shall have pressure transducers monitoring the refrigerant discharge (high) and suction (low) pressures. The refrigeration circuit shall be accessible for diagnostics, adjustment and servicing without the need of service manifold gauges
3. The following status LEDs shall be on the controller:
   a. Alarm - indicates there has been a failure requiring service.
   b. Dehumidification - indicates that the system is dehumidifying the space.
   c. Cooling - indicates that the air-conditioning mode.
   d. Space Heat - indicates that the space heating is operating.
   e. Maintenance - indicates whether or not maintenance is required.
   f. Manual - indicates that the system has been set to manual operation.
4. The following set points shall be accessible and adjustable from the operator panel:
   a. Space temperature
   b. Space relative humidity
5. The following sensors shall be unit-mounted and monitored at the operator panel. All information from these items shall be actively used in the system control and operation strategies:
   a. Refrigerant high pressure
   b. Refrigerant low pressure
   c. Return air temperature
   d. Supply air temperature
   e. Return air relative humidity
   f. Evaporator leaving air temperature
   g. Suction temperature
   h. Discharge temperature
6. System Fault: Shall indicate via text message to the display what systems require attention or servicing. Built-in monitoring and diagnostics shall allow the user to view the following:
   a. Power failure
   b. Dirty air filter
   c. Refrigerant high and low pressure
   d. System off
   e. Anti-short cycle delay

P. Air Heating
1. The packaged indirect-fired natural gas duct furnace module shall be sized to meet the scheduled heating capacity and have the following characteristics:
   a. Modulating (0-10V) auxiliary air heat control
   b. The duct furnace module shall be a natural gas indirect-fired type using spark ignition with a heating capacity as shown in this submittal and is installed in a 'blow through' configuration downstream from the blower. The heat exchanger tubes are constructed of formed and welded 16-gauge series 409 stainless steel suitable for installation downstream of the cooling coil and satisfactory for air inlet temperatures below 40 °F. The burner is the power firing type and incorporates a primary combustion air blower and spark ignition transformer
   c. Standard controls shall include a modulating gas valve, intermittent spark ignition, overheat control, rollout flame supervision, combustion air flow proving switch,

positive burner safety switch, pilot cock, main gas cock with 100% shut off, adjustable main and pilot pressure regulators

d. The natural gas duct furnace module shall be an ETL recognized component. The gas train shall be complete with all controls factory mounted to comply with requirements of ETL. The gas train is complete with a modulating main gas valve and is ready for connection to a natural gas supply with pressure between 7 in and 14 in WC
e. The complete system shall be test-fired and preliminary adjustments made prior to leaving the factory

Q. Air Conditioning
1. Air-cooled air conditioning via outdoor condenser
a. The system shall be equipped with an air conditioning mode where excess compressor heat is rejected to a factory-packaged, integral outdoor air-cooled condenser. The outdoor air-cooled condenser shall be capable of rejecting 100% of the compressor heat rejection with an air-on temperature at summer design conditions. The outdoor condenser shall be equipped with a 24VAC controls, including a contactor for the fan motor
b. The system shall be provided with a dry contact rated for 5A at 24VAC to operate the remote outdoor condenser controls
c. Each refrigeration circuit shall include refrigerant valves, a receiver with pressure relief valve set to 650 psig, a pressure control valve and a pressure differential valve, and two manual shutoff valves to isolate the outdoor condenser
d. Coils shall be tested at 600 PSIG and mounted vertically for complete surface utilization. Coils shall be counter flow with a minimum of 10 degrees of liquid sub-cooling and have adequate capacity to dissipate the total heat rejection of the system at design conditions. Condensers shall have guards to protect the coils from vandalism and weather-related damage
e. The fan(s) shall be direct driven axial fan(s) made of aluminum in which the motor and controller are integrated. The fan includes an EC commutated direct-current external rotor motor to provide maximum efficiency and the quietest performance. The EC motor shall have maintenance-free electronic circuitry, a rotor with permanent magnets and an integral controller to provide the windings with electrical current so that the motor rotates continuously and quietly. The fan has an aerodynamically-optimized, sickle-blade profile, patterned with serrated trailing edge and winglets on the blade outer edge for energy and noise-optimized operation
1) The fan assembly shall be balanced in Class G 6.3 acc DIN ISO 1940, dynamic on two levels
2) The fan assembly shall be suitable for ambient temperatures of -40°C to max. +70°C
3) Thermal contacts installed in the windings compliant with THCL 155
4) Drive motor in external rotor principle, sealed in protection class IP54 with moisture protection impregnation of the windings, topical protection
5) High corrosion resistance design with high quality and reliability

R. Roof Curb
1. The roof curb shall be a prefabricated, perimeter type curb made of 12-gauge galvanized steel with stiffeners, 2.000 in x 2.000 in treated wood nailer strip and not less than 1.500 in of rigid acoustical and thermal fiberglass insulation, knocked-down for shipment. 1.000 in x 0.250 in adhesive gasketing and all necessary hardware shall be provided for field assembly of the curb on the roof decking prior to system shipment

S. Factory Performance Testing
1. The system shall be thoroughly tested under factory test conditions.

2.04 SEQUENCE OF OPERATION

A. SEE SPECIFICATION SECTION 23 09 93.

2.05 BACNET MS/TP

A. The dehumidifier control panel shall be capable of direct connection to a BACnet MS/TP-based building automation system. With proper connection to the RS-485 network, the dehumidifier shall appear as a native BACnet device.

PART 3 - EXECUTION

3.01 FUNCTIONAL FACTORY TEST AND VERIFICATION

A. The completed unit shall be completely tested for functionality in the factory before shipment.

B. The functional test shall consist of an in-unit test of the controller, inputs, outputs, safeties and the basic sequence of operation. Also, part of the functional test will be verification of the operation of compressor(s), fan(s), associated electrical components and if furnished, gas furnace controls and the valve actuators for coils. The functional test shall not be construed as a performance or capacity test.

C. Each unit will have a record of the test documented with the unit serial number. Field testing of components or the sequence of operation is not a substitute for factory testing.

D. A copy of the functional test report shall be maintained on file at the factory and can be furnished upon request.

3.02 INSTALLATION

A. Comply with manufacturer's printed instructions except where more stringent requirements are shown or specified and where manufacturer's technical representative directs otherwise.

B. Install unit where shown on drawings. Provide 3’ feet clearance around sides and 4’ feet around compressor compartment of unit for airflow and service. Provide a means for access to all sides of the unit.

3.03 BUILD ON-SITE OPTION

A. PoolPak shall provide factory personnel to field erect unit. All materials to complete the unit shall be assembled at PoolPak when complete they shall be trucked to the site for assembly. Others will clear the area for assembly of the new unit. Others are responsible for moving all the dehumidifier materials into the mechanical room. Others will be responsible to provide labor and a gantry or other means to lift heavy pieces into place. Factory personnel shall build in place the dehumidifier in compliance with the specification. When the unit assembly is completed, refrigerant lines shall be vacuumed and the unit charged with refrigerant. Others will then connect the ducts, electrical wiring, cold wall sensor, pool water piping and OA sensor if required. Others will install a new air conditioning remote heat rejection condenser and replace all interconnecting refrigerant lines. The lines must be vacuumed and oil and refrigerant added per dehumidifier’s current service manual requirements.

B. Start-up of the unit shall be by PoolPak factory authorized and trained personnel. Owner training will be provided. All standard PoolPak warranties will apply.

C. Split Units shall not be allowed.

3.04 START-UP, OWNER TRAINING & WARRANTY

A. All units shall be thoroughly cleaned by the installing contractor in accordance with the manufacturer's instructions, prior to being placed into service.

B. Start-up service shall be provided by the equipment manufacturer's authorized representative and shall include complete testing of all controls and unit operation. The agency responsible for start-up shall record the refrigeration system pressures and electrical operating data. Copies of this data are to be supplied to the owner. US - Standard

C. A complete operating and maintenance manual, including wiring diagrams, start-up and operating sequence and material list shall be provided to the owner. The owner shall be provided with complete instruction of operating and maintenance procedures.

D. Manufacturer shall provide owner with on site training by factory-trained service personnel. Training shall cover the operation and maintenance requirements of this unit. This training session shall be held at time of factory start up.

E. Manufacturer shall provide to the owner a web-based, instructional video program for use by field personnel.

F. Manufacturer shall provide a 30-day labor and 25-month parts warranty on the entire unit.

G. Manufacturer shall provide a 3-5 year extended compressor part warranty.

H. Manufacturer shall provide a 10 year coil parts warranty, unconditional of pool water chemistry. (Electro-Guard Plus coil coating)

I. Manufacturer shall provide a 5 year coil parts warranty, contingent on proper maintenance of pool water chemistry. (Hycor Blue coil coating)

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Underground feeder and branch-circuit cable.

C. Service entrance cable.

D. Armored cable.

E. Metal-clad cable.

F. Wiring connectors.

G. Electrical tape.

H. Heat shrink tubing.

I. Oxide inhibiting compound.

J. Wire pulling lubricant.

K. Cable ties.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 26 05 01 - Minor Electrical Demolition: Disconnection, removal, and/or extension of existing electrical conductors and cables.

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 28 31 00 - Fire Detection and Alarm: Fire alarm system conductors and cables.

F. Section 31 23 16 - Excavation.

G. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

H. Section 31 23 23 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.

F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

H. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.

I. NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF); 2007.

J. NEMA WC 70 - Nonshielded Power Cable 2000 V or Less for the Distribution of Electrical Energy; 2009.

K. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. UL 4 - Armored Cable; Current Edition, Including All Revisions.

N. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

O. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

P. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

Q. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

R. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

S. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.

T. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

U. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Sustainable Design Documentation: Submit manufacturer's product data on conductor and cable showing compliance with specified lead content requirements.

D. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.

H. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.

I. Conductor Material:
   1. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B 787M unless otherwise indicated.
   2. Tinned Copper Conductors: Comply with ASTM B33.

J. Minimum Conductor Size:
   1. Branch Circuits: 12 AWG.
      a. Exceptions:
         1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
         2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
         3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
   2. Control Circuits: 14 AWG.

K. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
      a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
   3. Color Code:

a. 480Y/277 V, 3 Phase, 4 Wire System:
   1) Phase A: Brown.
   2) Phase B: Orange.
   3) Phase C: Yellow.
   4) Neutral/Grounded: Gray.
b. 208Y/120 V, 3 Phase, 4 Wire System:
   1) Phase A: Black.
   2) Phase B: Red.
   3) Phase C: Blue.
   4) Neutral/Grounded: White.
c. Equipment Ground, All Systems: Green.
d. Isolated Ground, All Systems: Green with yellow stripe.
e. Travelers for 3-Way and 4-Way Switching: Pink.
f. For control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
   1. Copper Building Wire:
      a. Cerro Wire LLC: www.cerrowire.com/#sle.
      b. Southwire Company: www.southwire.com/#sle.
      c. Houston Wire & Cable co.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
   1. Feeders and Branch Circuits:
      a. Size 10 AWG and Smaller: Solid.
      b. Size 8 AWG and Larger: Stranded.
   2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
   1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
      a. Size 4 AWG and Larger: Type XHHW-2.
      b. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

2.04 UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE

A. Manufacturers:
   1. Cerro Wire LLC: www.cerrowire.com/#sle.
   2. Southwire Company: www.southwire.com/#sle.
   3. Houston Wire & Cable co..
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type UF multiple-conductor cable listed and labeled as complying with UL 493, Type UF-B.

C. Provide equipment grounding conductor unless otherwise indicated.

D. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.
   2. Size 8 AWG and Larger: Stranded.

E. Insulation Voltage Rating: 600 V.

2.05 SERVICE ENTRANCE CABLE

A. Conductor Stranding: Stranded.

B. Insulation Voltage Rating: 600 V.

2.06 ARMORED CABLE

A. Manufacturers:
   1. AFC Cable Systems Inc: www.afcweb.com/#sle.
   2. Encore Wire Corporation: www.encorewire.com/#sle.
   3. Southwire Company: www.southwire.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type AC cable listed and labeled as complying with UL 4, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.
   2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN.

F. Grounding: Combination of interlocking armor and integral bonding wire.
   1. Provide additional full-size integral insulated equipment grounding conductor for redundant grounding, suitable for general purpose, non-essential electrical systems in non-hazardous patient care areas of health care facilities.

G. Armor: Steel, interlocked tape.

2.07 METAL-CLAD CABLE

A. Manufacturers:
   1. AFC Cable Systems Inc: www.afcweb.com/#sle.
   2. Encore Wire Corporation: www.encorewire.com/#sle.
   3. Southwire Company: www.southwire.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.
   2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

F. Provide dedicated neutral conductor for each phase conductor where indicated or required.

G. Grounding: Full-size integral equipment grounding conductor.
   1. Provide additional isolated/insulated grounding conductor where indicated or required.

H. Armor: Steel, interlocked tape.

I. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

2.08 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.

C. Wiring Connectors for Splices and Taps:
   1. Copper Conductors Sizes 10 and under: Use twist-on insulated spring connectors.
   2. Copper Conductors Sizes 8 and larger: Use mechanical connectors.

D. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
4. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
1. Manufacturers:
a. 3M: www.3m.com/#sle.
b. Ideal Industries, Inc: www.idealindustries.com/#sle.
c. NSI Industries LLC: www.nsiindustries.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.

H. Mechanical Connectors: Provide bolted type or set-screw type.
1. Manufacturers:
a. Burndy: www.burndy.com.
b. Ilsco: www.ilsco.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.

I. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
1. Manufacturers:
a. Burndy: www.burndy.com.
b. Ilsco: www.ilsco.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.

2.09 WIRING ACCESSORIES

A. Electrical Tape:
1. Manufacturers:
a. 3M: www.3m.com/#sle.
b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.
c. Substitutions: See Section 01 60 00 - Product Requirements.
2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
a. Product: 3 M.
b. Substitutions: See Section 01 60 00 - Product Requirements.
3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
a. Product: 3 M.
b. Substitutions: See Section 01 60 00 - Product Requirements.
4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.

5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.
7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.
      b. Burndy: www.burndy.com.
      c. Thomas & Betts Corporation: www.tnb.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
   1. Manufacturers:
      a. Burndy: www.burndy.com.
      b. Ideal Industries, Inc: www.idealindustries.com/#sle.
      c. Ilsco: www.ilsco.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.
      b. American Polywater Corporation: www.polywater.com/#sle.
      c. Ideal Industries, Inc: www.idealindustries.com/#sle.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

E. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as shown on the drawings.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:
   1. Unless dimensioned, circuit routing indicated is diagrammatic.
   2. When circuit destination is indicated and routing is not shown, determine exact routing required.
   3. Arrange circuiting to minimize splices.
   4. Include circuit lengths required to install connected devices within 10 ft of location shown.
   5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
   6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.

7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are shown as separate, combining them together in a single raceway is not permitted.

B. Install products in accordance with manufacturer's instructions.

C. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.

D. Install underground feeder and branch-circuit cable (Type UF-B) in accordance with NECA 121.

E. Install armored cable (Type AC) in accordance with NECA 120.

F. Install metal-clad cable (Type MC) in accordance with NECA 120.

G. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
   3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
   4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

H. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

I. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

J. Terminate cables using suitable fittings.
   1. Armored Cable (Type AC):
      a. Use listed fittings and anti-short, insulating bushings.
      b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
   2. Metal-Clad Cable (Type MC):
      a. Use listed fittings.
      b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

K. Install conductors with a minimum of 12 inches of slack at each outlet.

L. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

M. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

N. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

O. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
   5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

P. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
   1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
      b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
   2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
      b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
   3. Wet Locations: Use heat shrink tubing.

Q. Insulate ends of spare conductors using vinyl insulating electrical tape.

R. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

S. Identify conductors and cables in accordance with Section 26 05 53.

T. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

U. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

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SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

F. Ground enhancement material.

G. Ground access wells.

H. Grounding and bonding components.

I. Provide all components necessary to complete the grounding system(s) consisting of:
   1. Existing metal underground water pipe.
   2. Metal frame of the building.
   3. Existing metal underground gas piping system.
   4. Metal underground gas piping system.

1.02 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

C. Section 26 56 00 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.03 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2007.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

E. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2007.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify exact locations of underground metal water service pipe entrances to building.
   2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
   3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 25 ohms.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

C. Shop Drawings:

D. Product Data: Provide for grounding electrodes and connections.

E. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

F. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Project Record Documents: Record actual locations of grounding electrode system components and connections.

H. Project Record Documents: Record actual locations of components and grounding electrodes.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Installer Qualifications for Signal Reference Grids: Company with minimum five years documented experience with high frequency grounding systems.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
   3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

E. Grounding Electrode System:

1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    a. Provide continuous grounding electrode conductors without splice or joint.
    b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
2. Metal Underground Water Pipe(s):
    a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
    b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
    c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
3. Metal Building or Structure Frame:
    a. Provide connection to metal building or structure frame effectively grounded in accordance with NFPA 70 at nearest accessible location.
4. Ground Ring:
    a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches.
    b. Where location is not indicated, locate ground ring conductor at least 24 inches outside building perimeter foundation.
    c. Provide ground enhancement material around conductor where indicated.
    d. Provide connection from ground ring conductor to:
        1) Perimeter columns of metal building frame.
        2) Ground rod electrodes located as indicated.
5. Ground Rod Electrode(s):
    a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
    b. Space electrodes not less than 10 feet from each other and any other ground electrode.
    c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
    d. Provide ground access well for each electrode.
6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

F. Service-Supplied System Grounding:
1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.

3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
   a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
   b. Metal gas piping.
8. Provide bonding for interior metal air ducts.
9. Provide bonding for metal building frame where not used as a grounding electrode.

H. Isolated Ground System:
1. Where isolated ground receptacles or other isolated ground connections are indicated, provide separate isolated/insulated equipment grounding conductors.
2. Connect isolated/insulated equipment grounding conductors only to separate isolated/insulated equipment ground busses.
3. Connect the isolated/insulated equipment grounding conductors to the solidly bonded equipment ground bus only at the service disconnect or separately derived system disconnect. Do not make any other connections between isolated ground system and normal equipment ground system on the load side of this connection.

I. Pole-Mounted Luminaires: Also comply with Section 26 56 00.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
1. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in addition to requirements of Section 26 05 19:
1. Use insulated copper conductors unless otherwise indicated.
   a. Exceptions:
      1) Use bare copper conductors where installed underground in direct contact with earth.
      2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
   a. Exceptions:
      1) Use mechanical connectors for connections to electrodes at ground access wells.
3. Unless otherwise indicated, use exothermic welded connections for accessible connections.
   a. Exceptions:
      1) Use exothermic welded connections for connections to metal building frame.
4. Manufacturers - Mechanical and Compression Connectors:
   a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
   b. Burndy: www.burndy.com.

c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.

5. Manufacturers - Exothermic Welded Connections:
a. Burndy: www.burndy.com.
b. Cadweld, a brand of Erico International Corporation: www.erico.com/#sle.
c. ThermOweld, a brand of Continental Industries, Inc: www.thermoweld.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.
4. Manufacturers:
a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
b. Erico International Corporation: www.erico.com/#sle.
c. Harger Lightning & Grounding: www.harger.com/#sle.
d. ThermOweld, a brand of Continental Industries, Inc: www.thermoweld.com/#sle.
e. Substitutions: See Section 01 60 00 - Product Requirements.

E. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.
4. Manufacturers:
a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
b. Erico International Corporation: www.erico.com/#sle.
c. Galvan Industries, Inc: www.galvanelectrical.com/#sle.
d. Harger Lightning & Grounding: www.harger.com/#sle.
e. Substitutions: See Section 01 60 00 - Product Requirements.

F. Ground Enhancement Material:
1. Description: Factory-mixed conductive material designed for permanent and maintenance-free improvement of grounding effectiveness by lowering resistivity.
2. Resistivity: Not more than 20 ohm-cm in final installed form.
3. Manufacturers:
a. Erico International Corporation: www.erico.com/#sle.
b. Harger Lightning & Grounding: www.harger.com/#sle.
c. ThermOweld, a brand of Continental Industries, Inc: www.thermoweld.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.

G. Ground Access Wells:
1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
a. Round Wells: Not less than 8 inches in diameter.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.
4. Cover: Factory-identified by permanent means with word "GROUND".
5. Manufacturers:
a. Advanced Lightning Technology (ALT): www.altfab.com/#sle.
b. Erico International Corporation: www.erico.com/#sle.
c. Harger Lightning & Grounding: www.harger.com/#sle.
d. ThermOweld, a brand of Continental Industries, Inc: www.thermoweld.com.
e. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 MANUFACTURERS

A. Cooper Power Systems: www.cooperpower.com.

B. Framatome Connectors International: www.fciconnect.com.

C. Lightning Master Corporation: www.lightningmaster.com.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 CONNECTORS AND ACCESSORIES

A. Mechanical Connectors: Bronze.
   1. Substitutions: See Section 01 60 00 - Product Requirements.

B. Wire: Stranded copper.

C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as shown on the drawings.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify existing conditions prior to beginning work.

E. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install grounding and bonding system components in a neat and workmanlike manner in accordance with NECA 1.

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
   1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.

D. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
   4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26 05 53.

F. Provide bonding to meet requirements described in Quality Assurance.

G. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing. Each of branch circuits and feeder circuits shall have dedicated equipment grounding conductor, sharing this conductor with other grounding conductors is not permitted.

3.03 FIELD QUALITY CONTROL

A. Perform inspection in accordance with Section 01 40 00.

B. Inspect and test in accordance with NETA STD ATS except Section 4.

C. Perform inspections and tests listed in NETA STD ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

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SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 05 50 00 - Metal Fabrications: Materials and requirements for fabricated metal supports.

C. Section 26 05 34 - Conduit: Additional support and attachment requirements for conduits.

D. Section 26 05 37 - Boxes: Additional support and attachment requirements for boxes.

E. Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

F. Section 26 56 00 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2013.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.

C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

D. Installer's Qualifications: Include evidence of compliance with specified requirements.

E. Product Data: Provide manufacturer’s catalog data for fastening systems.

F. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

D. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.

E. Installer Qualifications for Field-Welding: As specified in Section 05 50 00.

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with the following. Where requirements differ, comply with most stringent.
      a. NFPA 70.
      b. Requirements of authorities having jurisdiction.
   2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
   3. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 1.5. Include consideration for vibration, equipment operation, and shock loads where applicable.
   5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
      c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.

C. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.
3. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.
    b. Erico International Corporation: www.erico.com/#sle.
    c. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com/#sle.
    d. Thomas & Betts Corporation: www.tnb.com/#sle.
    e. Substitutions: See Section 01 60 00 - Product Requirements.

D. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
1. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.
    b. Erico International Corporation: www.erico.com/#sle.
    c. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com/#sle.
    d. Thomas & Betts Corporation: www.tnb.com/#sle.
    e. Substitutions: See Section 01 60 00 - Product Requirements.

E. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
1. Comply with MFMA-4.
2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
3. Channel Material:
    a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
4. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
5. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
6. Manufacturers:
    a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.
    b. Thomas & Betts Corporation: www.tnb.com/#sle.
    c. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.
    d. Substitutions: See Section 01 60 00 - Product Requirements.
    e. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.

F. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
    a. Equipment Supports: 1/2 inch diameter.
    b. Single Conduit up to 1 inch (27mm) trade size: 1/4 inch diameter.
    c. Single Conduit larger than 1 inch (27mm) trade size: 3/8 inch diameter.
    d. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
    e. Outlet Boxes: 1/4 inch diameter.
    f. Luminaires: 1/4 inch diameter.

G. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.

7. Sheet Metal: Use sheet metal screws.
8. Powder-actuated fasteners are not permitted.
9. Hammer-driven anchors and fasteners are not permitted.
10. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Comply with MFMA-4.
    b. Channel Material: Use galvanized steel.
    c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

2.02 MANUFACTURERS

A. Thomas & Betts Corporation: www.tnb.com.

B. Threaded Rod Company: www.threadedrod.com.

C. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 MATERIALS

A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.

B. Supports: Fabricated of structural steel or formed steel members; galvanized.

C. Anchors and Fasteners:
1. Do not use powder-actuated anchors.
2. Obtain permission from Architect before using powder-actuated anchors.
3. Concrete Structural Elements: Use precast inserts.
4. Steel Structural Elements: Use beam clamps.
5. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
6. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use hollow wall fasteners.
7. Solid Masonry Walls: Use expansion anchors.
8. Sheet Metal: Use sheet metal screws.
9. Wood Elements: Use wood screws.

D. Formed Steel Channel:
1. Product: manufactured by [B-Line.
2. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install support and attachment components in a neat and workmanlike manner in accordance with NECA 1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Conduit Support and Attachment: Also comply with Section 26 05 34.

I. Box Support and Attachment: Also comply with Section 26 05 37.

J. Interior Luminaire Support and Attachment: Also comply with Section 26 51 00.

K. Exterior Luminaire Support and Attachment: Also comply with Section 26 56 00.

L. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

M. Secure fasteners according to manufacturer's recommended torque settings.

N. Remove temporary supports.

O. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

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SECTION 26 05 34
CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).
B. Flexible metal conduit (FMC).
C. Liquidtight flexible metal conduit (LFMC).
D. Electrical metallic tubing (EMT).
E. Rigid polyvinyl chloride (PVC) conduit.
F. Conduit fittings.
G. Accessories.
H. Conduit, fittings and conduit bodies.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete encasement of conduits.
B. Section 07 84 00 - Firestopping.
C. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Metal clad cable (Type MC), armored cable (Type AC), and manufactured wiring systems, including uses permitted.
D. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
E. Section 26 05 29 - Hangers and Supports for Electrical Systems.
F. Section 26 0553 - Identification for Electrical Systems.
G. Section 26 05 37 - Boxes.
H. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
I. Section 31 23 16 - Excavation.
J. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
C. ANSI C80.5 - American National Standard for Electrical Rigid Aluminum Conduit (ERAC); 2005.
D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.
G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.
H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
I. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
J. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
K. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
L. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
M. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

N. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
   4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
   5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

C. Shop Drawings:
   1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
   2. Include proposed locations of roof penetrations and proposed methods for sealing.

D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

E. Product Data: Provide for metallic conduit and flexible metal conduit.

F. Samples of Materials Actually Delivered to Site:
   1. Two pieces each of conduit, 2 feet long.

G. Project Record Documents: Accurately record actual routing of conduits larger than 2 inches.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

D. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Under Slab on Grade: Use rigid PVC conduit.
   2. Exterior, Direct-Buried: Use rigid PVC conduit.
   3. Exterior, Embedded Within Concrete: Use rigid PVC conduit.
   4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
   5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.

D. Embedded Within Concrete:

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit.

F. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit.

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.
   1. Locations subject to physical damage include, but are not limited to:
      a. Where exposed below 8 feet, except within electrical and communication rooms or closets.

K. Exposed, Exterior: Use galvanized steel rigid metal conduit.

L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit.

M. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
   1. Maximum Length: 6 feet.

N. Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit.
   2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
   3. Maximum Length: 6 feet unless otherwise indicated.
   4. Vibrating equipment includes, but is not limited to:
      a. Transformers.
      b. Motors.
      c. HVAC equipment.

O. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.02 CONDUIT REQUIREMENTS

A. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.

C. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Branch Circuits: 3/4 inch (21 mm) trade size.
   2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
   3. Control Circuits: 1/2 inch (16 mm) trade size.

4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.
5. Underground, Interior: 3/4 inch (21 mm) trade size.
6. Underground, Exterior: 1 inch (27 mm) trade size.

D. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
1. Allied Tube & Conduit: www.alliedeg.com/#sle.
2. Republic Conduit: www.republic-conduit.com/#sle.
3. Wheatland Tube Company: www.wheatland.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:
1. Manufacturers:
a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 METAL CONDUIT

A. Manufacturers:
1. Allied Tube & Conduit: www.alliedtube.com.
2. Beck Manufacturing, Inc: www.beckmfg.com.
3. Wheatland Tube Company: www.wheatland.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Rigid Steel Conduit: ANSI C80.1.

C. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.05 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:
1. AFC Cable Systems, Inc: www.afcweb.com/#sle.
2. Electri-Flex Company: www.electriflex.com/#sle.
3. International Metal Hose: www.metalhose.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

C. Fittings:
1. Manufacturers:
a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Material: Use steel or malleable iron.

D. Description: Interlocked steel construction.

E. Fittings: NEMA FB 1.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:
1. AFC Cable Systems, Inc; _____: www.afcweb.com/#sle.
2. Electri-Flex Company; _____: www.electriflex.com/#sle.
3. International Metal Hose; _____: www.metalhose.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:
1. Manufacturers:
a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.

2.07 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
1. Allied Tube & Conduit; _____: www.alliedeg.com/#sle.
2. Republic Conduit: www.republic-conduit.com/#sle.
3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:
1. Manufacturers:
a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
4. Connectors and Couplings: Use compression (gland) or set-screw type.
a. Do not use indenter type connectors and couplings.
5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.
6. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:
1. Cantex Inc: www.cantexinc.com/#sle.
2. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com/#sle.
3. JM Eagle: www.jmeagle.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.09 ACCESSORIES

A. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

B. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

C. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.

D. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.

E. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on drawings.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify routing and termination locations of conduit prior to rough-in.

E. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

E. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated and routing is not shown, determine exact routing required.
   3. Conceal all conduits unless specifically indicated to be exposed.
   4. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Mechanical equipment rooms.
      c. Within joists in areas with no ceiling.
   5. Arrange conduit to maintain adequate headroom, clearances, and access.
   6. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
   7. Arrange conduit to provide no more than 150 feet between pull points.
   8. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
   9. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
   10. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:

a. Heaters.
b. Hot water piping.
c. Flues.

11. Group parallel conduits in the same area together on a common rack.

F. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.
a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
8. Use of spring steel conduit clips for support of conduits is not permitted.
9. Use of wire for support of conduits is not permitted.
a. For securing conduits to studs in hollow stud walls.
b. For suspending conduits supported by spring steel conduit clips (only where specifically indicated or permitted).

G. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

H. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.

8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

I. Underground Installation:
   1. Provide trenching and backfilling in accordance with Section 31 23 16.13.
   2. Minimum Cover, Unless Otherwise Indicated or Required:
      a. Underground, Exterior: 24 inches.
      b. Under Slab on Grade: 12 inches to bottom of slab.
   3. Provide underground warning tape in accordance with Section 26 05 53 along entire conduit length.

J. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 30 00 with minimum concrete cover of 3 inches on all sides unless otherwise indicated.

K. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with NFPA 70.

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
   1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
   2. Where conduits are subject to earth movement by settlement or frost.

M. Conduit Sealing:
   1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
      a. Where conduits enter building from outside.
      b. Where service conduits enter building from underground distribution system.
      c. Where conduits enter building from underground.
      d. Where conduits may transport moisture to contact live parts.
   2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
      a. Where conduits pass from outdoors into conditioned interior spaces.
      b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

N. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
   1. Where conduits pass from outdoors into conditioned interior spaces.
   2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

O. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

P. Provide grounding and bonding in accordance with Section 26 05 26.

Q. Identify conduits in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

3.06 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

B. Route conduit through roof openings for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing installation specified in Section roofing section.

END OF SECTION

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SECTION 26 05 35
SURFACE RACEWAYS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface raceway systems.

B. Wireways.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
   1. Includes metal channel (strut) used as raceway.

C. Section 26 05 34 - Conduit.

D. Section 26 05 37 - Boxes.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 27 26 - Wiring Devices: Receptacles.

G. Section 27 10 05 - Structured Cabling for Voice and Data - Inside-Plant: Voice and data jacks.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 5 - Surface Metal Raceways and Fittings; Current Edition, Including All Revisions.

D. UL 111 - Outline of Investigation for Multioutlet Assemblies; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of raceways with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate rough-in locations of outlet boxes provided under Section 26 05 37 and conduit provided under Section 26 05 34 as required for installation of raceways provided under this section.
   3. Verify minimum sizes of raceways with the actual conductors and components to be installed.
   4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install raceways until final surface finishes and painting are complete.
   2. Do not begin installation of conductors and cables until installation of raceways is complete between outlet, junction and splicing points.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including dimensions, knockout sizes and locations, materials, fabrication details, finishes, service condition requirements, and accessories.
   1. Surface Raceway Systems: Include information on fill capacities for conductors and cables.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 RACEWAY REQUIREMENTS

A. Provide all components, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.

C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

2.02 SURFACE RACEWAY SYSTEMS

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell-wiring.com.
   2. Wiremold, a brand of Legrand North America, Inc: www.legrand.us/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Surface Metal Raceways: Listed and labeled as complying with UL 5.

C. Multioutlet Assemblies: Listed and labeled as complying with UL 111.

D. Metal Channel (Strut) Used as Raceway: Comply with Section 26 05 29.

E. Type DS-4000 - Surface Raceway System:
   1. Raceway Type: Two channel, painted steel.
   2. Size: 4 3/4"_ by 1 3/4 " inches.
   3. Length: As indicated on the drawings.
   4. Color: To be selected by Architect.
   5. Accessory Device Boxes: Suitable for the devices to be installed; color to match raceway.
   6. Integrated Device Provisions:
      a. Receptacles:
         1) Comply with Section 26 27 26, except for finishes.
         2) Configuration: As indicated on the drawings.
         3) Color: Match raceway.
         4) Spacing: As indicated on the drawings.
      b. Communications Outlets:
         1) Voice and Data Jacks: As specified in Section 27 10 05.
         2) Configuration: As indicated on the drawings.
         3) Spacing: As indicated on the drawings.
   7. Products:
      a. _Pass & Seymour.
      b. Wiremold_.
      c. Substitutions: See Section 01 60 00 - Product Requirements.
   8. Applications:
      a. Class rooms, Hallways and Labs.

2.03 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes and conduit terminations are installed in proper locations and are properly sized in accordance with NFPA 70 to accommodate raceways.

C. Verify that mounting surfaces are ready to receive raceways and that final surface finishes are complete, including painting.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install raceways in a neat and workmanlike manner in accordance with NECA 1.

C. Install raceways plumb and level.

D. Secure and support raceways in accordance with Section 26 05 29 at intervals complying with NFPA 70 and manufacturer's requirements.

E. Close unused raceway openings.

F. Provide grounding and bonding in accordance with Section 26 05 26.

G. Identify raceways in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect raceways for damage and defects.

C. Surface Raceway Systems with Integrated Devices: Test each wiring device to verify operation and proper polarity.

D. Correct wiring deficiencies and replace damaged or defective raceways.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 PROTECTION

A. Protect installed raceways from subsequent construction operations.

END OF SECTION

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SECTION 26 05 37
BOXES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C. Wall and ceiling outlet boxes.

D. Floor boxes.

E. Pull and junction boxes.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 27 26 - Wiring Devices:
   1. Wall plates.

E. Section 26 2716 - Electrical Cabinets and Enclosures.

F. Section 26 2726 - Wiring Devices: Wall plates in finished areas, floor box service fittings, fire-rated poke-through fittings, and access floor boxes.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.

D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.

E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
   4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.

5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use suitable concrete type boxes where flush-mounted in concrete.
4. Use suitable masonry type boxes where flush-mounted in masonry walls.
5. Use raised covers suitable for the type of wall construction and device configuration where required.
6. Use shallow boxes where required by the type of wall construction.
7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
12. Wall Plates: Comply with Section 26 27 26.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
3. Junction and Pull Boxes Larger Than 100 cubic inches:

a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

2.02 MANUFACTURERS

A. Appleton Electric: www.appletonelec.com.

B. Steel City

C. Substitutions: Reco, Inc. See Section 01 60 00 - Product Requirements.

2.03 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
   1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
   2. Concrete Ceiling Boxes: Concrete type.

B. Nonmetallic Outlet Boxes: NEMA OS 2.

C. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.

D. Wall Plates for Finished Areas: As specified in Section 26 2726.

2.04 FLOOR BOXES

A. Floor Boxes: NEMA OS 1, fully adjustable, _4 inches deep.

B. Material: Cast metal.

C. Shape: Rectangular.

D. Service Fittings: As specified in Section 26 2726.

2.05 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Hinged Enclosures: As specified in Section 26 2716.

C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
   1. Material: Galvanized cast iron; Cast Aluminum.
   2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

D. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting:
   1. Material: Galvanized cast iron; Cast Aluminum.
   2. Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.
   3. Cover Legend: "ELECTRIC".

PART 3 EXECUTION

3.01 EXAMINATION

3.02

A. Verify that field measurements are as shown on drawings.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify locations of floor boxes and outlets in offices and work areas prior to rough-in.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Box Supports:
   1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

E. Install boxes plumb and level.

F. Flush-Mounted Boxes:
   1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
   2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
   3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

G. Install boxes as required to preserve insulation integrity.

H. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

I. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

J. Close unused box openings.

K. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

L. Provide grounding and bonding in accordance with Section 26 05 26.

M. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.

N. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.

O. Coordinate installation of outlet boxes for equipment connected under Section 26 2717.

P. Set wall mounted boxes at elevations to accommodate mounting heights indicated.

Q. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
   1. Adjust box locations up to 10 feet if required to accommodate intended purpose.

R. Orient boxes to accommodate wiring devices oriented as specified in Section 26 2726.

S. Maintain headroom and present neat mechanical appearance.

T. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

U. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

V. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

W. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

X. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.

Y. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

Z. Use flush mounting outlet box in finished areas.

AA. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

AB. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.

AC. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

AD. Use stamped steel bridges to fasten flush mounting outlet box between studs.

AE. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

AF. Use adjustable steel channel fasteners for hung ceiling outlet box.

AG. Do not fasten boxes to ceiling support wires.

AH. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

AI. Use gang box where more than one device is mounted together. Do not use sectional box.

AJ. Use gang box with plaster ring for single device outlets.

AK. Use cast outlet box in exterior locations exposed to the weather and wet locations.

AL. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

AM. Set floor boxes level.

AN. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

3.04 ADJUSTING

A. Adjust floor boxes flush with finish flooring material.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closures in unused box openings.

3.05 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.06 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

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SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Warning signs and labels.

F. Field-painted identification of conduit.

1.02 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide catalog data for nameplates, labels, and markers.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.05 EXTRA MATERIALS

A. See Section 01 6000 - Product Requirements for additional requirements.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
   2. Arc Flash Hazard Warning Labels: Comply with Section 26 05 73.

B. Identification for Conductors and Cables:
   1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
   2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

C. Identification for Devices:
   1. Identification for Communications Devices: Comply with Section 27 10 05.
   2. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
   3. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles and light switches.

2.02 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Seton Identification Products: www.seton.com/aec.

C. HellermannTyton: www.hellermanntyton.com.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
   1. Materials:
   2. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:
   1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
   2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Nameplates: Engraved three-layer laminated plastic, black letters on white background.

D. Locations:
   1. Each electrical distribution and control equipment enclosure.
   2. Communication cabinets.
   3. Disconnect switches, and starters.

E. Letter Size:
   1. Use 1/8 inch letters for identifying individual equipment and loads.
   2. Use 1/4 inch letters for identifying grouped equipment and loads.

2.04 WIRE AND CABLE MARKERS

A. Manufacturers:
   1. Panduit Corp.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

F. Minimum Text Height: 1/8 inch.

G. Color: Black text on white background unless otherwise indicated.

H. Description: split sleeve type wire markers.

I. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, and junction boxes each load connection.

J. Legend:
   1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
   2. Control Circuits: Control wire number indicated on shop drawings.

2.05 VOLTAGE MARKERS

A. Manufacturers: Panduit Corp
   1. Substitutions: See Section 01 60 00 - Product Requirements.

B. Minimum Size:
   1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
   2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
   3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.

4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.

C. Legend:
1. Markers for Voltage Identification: Highest voltage present.
2. Markers for System Identification:
a. Emergency Power System: Text "EMERGENCY".
b. Other Systems: Type of service.

D. Color: Black text on orange background unless otherwise indicated.

E. Location: Furnish markers for each conduit longer than 6 feet.

F. Spacing: 20 feet on center.

G. Color:
1. 480 Volt System: Brown.
2. 208 Volt System: Yellow.
3. Fire Alarm System: Red.

H. Legend:
1. 480 Volt System: brown.
2. 208 Volt System: yellow.
3. Fire Alarm System: red.

2.06 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
1. Materials:
2. Minimum Size: 7 by 10 inches unless otherwise indicated.

C. Warning Labels:
1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

B. Degrease and clean surfaces to receive nameplates and labels.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
1. Surface-Mounted Equipment: Enclosure front.
2. Flush-Mounted Equipment: Inside of equipment door.
3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
4. Elevated Equipment: Legible from the floor or working platform.
5. Interior Components: Legible from the point of access.
6. Conductors and Cables: Legible from the point of access.
7. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

END OF SECTION

SECTION 26 05 73
OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Short-circuit study.

B. Protective device coordination study.

C. Arc flash and shock risk assessment.
   1. Includes arc flash hazard warning labels.

D. Short circuit study.

E. Coordination study and analysis.

1.02 RELATED REQUIREMENTS

A. Section 26 05 53 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

1.03 REFERENCE STANDARDS

A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.

B. IEEE 141 - IEEE Recommended Practice for Electric Power Distribution for Industrial Plants; 1993 (Reaffirmed 1999).

C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).

D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.

E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.

F. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).

G. NEMA MG 1 - Motors and Generators; 2014.

H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 70E - Standard for Electrical Safety in the Workplace; 2015.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Study reports, stamped or sealed and signed by study preparer.

C. Study Report: Submit protective device studies as specified, prior to submission of product data submittals or ordering or fabrication of protective devices.
   1. Include stamp or seal and signature of preparing engineer.

D. Field quality control reports.

1.05 POWER SYSTEM STUDIES

A. Scope of Studies:
   1. Perform analysis of new electrical distribution system as indicated on drawings.
      a. Include portions of electrical distribution system designated as "future."
   2. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).

3. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.

B. General Study Requirements:
   1. Comply with NFPA 70.
   2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

C. Data Collection:
   1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.
      a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.
         1) Obtain up-to-date information from Utility Company.
      b. Generators: Include manufacturer/model, kW and voltage ratings, and impedance.
      c. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 1 code letter designation.
      d. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.
      e. Protective Devices:
         1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).
         2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).
      f. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.
      g. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.

D. Short-Circuit Study:
   1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.
   2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:
      a. Maximum utility fault currents.
      b. Maximum motor contribution.
      c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
   3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.

E. Protective Device Coordination Study:
   1. Comply with applicable portions of IEEE 242 and IEEE 399.
   2. Analyze alternate scenarios considering known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
   3. Analyze protective devices and associated settings for suitable margins between time-current curves to provide adequate protection for equipment and conductors while achieving full selective coordination.
      a. _____.

F. Arc Flash and Shock Risk Assessment:
   1. Comply with NFPA 70E.

2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.
3. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:
    a. Maximum and minimum utility fault currents.
    b. Maximum and minimum motor contribution.
    c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

G. Study Reports:
1. General Requirements:
    a. Identify date of study and study preparer.
    b. Identify study methodology and software product(s) used.
    c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.
    d. Identify base used for per unit values.
    e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.
    f. Include conclusions and recommendations.
2. Short-Circuit Study:
    a. For each scenario, identify at each bus location:
        1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).
        2) Fault point X/R ratio.
        3) Associated equipment short circuit current ratings.
    b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.
3. Protective Device Coordination Study:
    a. For each scenario, include time-current coordination curves plotted on log-log scale graphs.
    b. For each graph include (where applicable):
        1) Partial single-line diagram identifying the portion of the system illustrated.
        2) Protective Devices: Time-current curves with applicable tolerance bands for each protective device in series back to the source, plotted up to the maximum available fault current at the associated bus.
        3) Conductors: Damage curves.
        4) Transformers: Inrush points and damage curves.
        5) Generators: Full load current, overload curves, decrement curves, and short circuit withstand points.
        6) Motors: Full load current, starting curves, and damage curves.
        7) Capacitors: Full load current and damage curves.
    c. For each protective device, identify fixed and adjustable characteristics with available ranges and recommended settings.
        1) Circuit Breakers: Include long time pickup and delay, short time pickup and delay, and instantaneous pickup.
        2) Include ground fault pickup and delay.
        3) Include fuse ratings.
        4) Protective Relays: Include current/potential transformer ratios, tap, time dial, and instantaneous pickup.
    d. Identify cases where either full selective coordination or adequate protection is not achieved, along with recommendations.
4. Arc Flash and Shock Risk Assessment:
    a. For the worst case for each scenario, identify at each bus location:
        1) Calculated incident energy and associated working distance.
        2) Calculated arc flash boundary.

3) Bolted fault current.
4) Arcing fault current.
5) Clearing time.
6) Arc gap distance.

b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.

1.06 PROTECTIVE DEVICE STUDY

A. Analyze the specific electrical and utilization equipment (according to NEC definition), the actual protective devices to be used, and the actual feeder lengths to be installed.
1. Study Methodology: Comply with requirements and recommendations of NFPA 70, IEEE 399, and IEEE 242.
2. Report: State the methodology and rationale employed in making each type of calculation; identify computer software package(s) used.

B. One-Line Diagrams: Prepare schematic drawing of electrical distribution system, with all electrical equipment and wiring to be protected by the protective devices; identify nodes on the diagrams for reference on report that includes:
1. Calculated fault impedance, X/R ratios, utility contribution, and short circuit values (asymmetric and symmetric) at the main switchboard bus and all downstream devices containing protective devices.
2. Breaker and fuse ratings.
3. Transformer kVA and voltage ratings, percent impedance, X/R ratios, and wiring connections.
4. Identification of each bus, with voltage.
5. Conduit materials, feeder sizes, actual lengths, and X/R ratios.

C. Short Circuit Study: Calculate the fault impedance to determine available 3-phase short circuit and ground fault currents at each bus and piece of equipment during normal conditions, alternate operations, emergency power conditions, and other operations that could result in maximum fault conditions.
1. Show fault currents available at key points in the system down to a fault current of 7,000 A at 480 V and 208 V.
2. Include motor contributions in determining the momentary and interrupting ratings of the protective devices.
3. Report: Include all pertinent data used in calculations and for each device include:
a. Device identification.
b. Protective device.
c. Device rating.
d. Calculated short circuit current, asymmetrical and symmetrical, and ground fault current.

D. Coordination Study: Perform an organized time-current analysis of each protective device in series from the individual device back to the primary source, under normal conditions, alternate operations, and emergency power conditions.
1. Graphically illustrate that adequate time separation exists between series devices, including upstream primary device.
2. Plot the specific time-current characteristics of each protective device on log-log paper.
3. Organize plots so that all upstream devices are clearly depicted on one sheet.
4. Also show the following on curve plot sheets:
a. Device identification.
b. Voltage and current transformer ratios for curves.
c. 3-phase and 1-phase ANSI damage curves for each transformer.
d. No-damage, melting, and clearing curves for fuses.
e. Cable damage curves.
f. Transformer inrush points.

g. Maximum short circuit cutoff point.
h. Simple one-line diagram for the portion of the system that each curve plot illustrates.
i. Software report for each curve plot, labeled for identification.

E. Analysis: Determine ratings and settings of protective devices to minimize damage caused by a fault and so that the protective device closest to the fault will open first.
1. Required Ratings and Settings: Derive required ratings and settings of protective devices in consideration of upstream protective device settings and optimize system to ensure selective coordination.
2. Identify any equipment that is underrated as specified.
3. Identify specified protective devices that will not achieve required protection or coordination and cannot be field adjusted to do so, and for which adequate devices would involve a change to the contract sum.
4. In all cases where adequate protection or coordination cannot be achieved at no extra cost to Owner, provide a discussion of alternatives and logical compromises for best achievable coordination.

F. Protective Device Rating and Setting Chart: Summarize in tabular format the required characteristics for each protective device based on the analysis; include:
1. Device identification.
2. Relay CT ratios, tap, time dial, and instantaneous pickup.
3. Circuit breaker sensor rating, long-time, short-time, and instantaneous settings, and time bands.
4. Fuse rating and type.
5. Ground fault pickup and time delay.
6. Input level and expected response time at two test points that are compatible with commonly available test equipment and the ratings of the protective device.
7. Highlight all devices that as furnished by Contractor will not achieve required protection.

1.07 QUALITY ASSURANCE

A. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.

B. Contractor Responsibility: Provide all project-related data needed by study preparer, including equipment, wire sizes, insulation types, conduit types, and actual circuit lengths.

C. Owner's Responsibility: Provide data on relevant Owner power distribution equipment.

PART 2 PRODUCTS

2.01 ARC FLASH HAZARD WARNING LABELS

A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.
1. Materials: Comply with Section 26 05 53.
2. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.
a. Include the following information:
1) Arc flash boundary.
2) Available incident energy and corresponding working distance.
3) Nominal system voltage.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install arc flash warning labels in accordance with Section 26 05 53.

3.02 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Adjust equipment and protective devices for compliance with studies and recommended settings.

D. Notify Architect of any conflicts with or deviations from studies. Obtain direction before proceeding.

E. Submit detailed reports indicating inspection and testing results, and final adjusted settings.

3.03 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

END OF SECTION

SECTION 26 09 19
ENCLOSED CONTACTORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General purpose contactors.

B. Lighting contactors.

1.02 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

C. Section 26 28 13 - Fuses.

1.03 REFERENCE STANDARDS

A. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).

B. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; 2017.

C. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).

D. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

E. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide dimensions, size, voltage ratings and current ratings.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Maintenance Data: Include instructions for replacing and maintaining coil and contacts.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.

C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Allen-Bradley/Rockwell Automation: www.ab.com/#sle.

B. Eaton Corporation; Cutler-Hammer Products: www.eaton.com/#sle.

C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 GENERAL PURPOSE CONTACTORS

A. Description: NEMA ICS 2, AC general purpose magnetic contactor.

B. Coil operating voltage: 120 volts, 60 Hertz.

C. Poles: As required to match circuit configuration and control function.

D. Enclosure: NEMA ICS 6, Type 1.

E. Accessories:
   1. Selector Switch: ON/OFF/AUTOMATIC.
   2. Indicating Light: RED.
   3. Auxiliary Contacts: One, normally open.

2.03 LIGHTING CONTACTORS

A. Description: NEMA ICS 2, magnetic lighting contactor.

B. Configuration: Mechanically held, 3 wire control.

C. Coil operating voltage: 120 volts, 60 Hertz.

D. Poles: As required to match circuit configuration and control function.

E. Contact Rating: Match branch circuit overcurrent protection, considering derating for continuous loads.

F. Enclosure: NEMA ICS 6, Type 1.

G. Accessories:
   1. Selector Switch: ON/OFF/AUTOMATIC.
   2. Indicating Light: RED.
   3. Auxiliary Contacts: One, normally open.

2.04 ACCESSORIES

A. Auxiliary Contacts: NEMA ICS 2, 2 normally open contacts in addition to seal-in contact.

B. Cover Mounted Pilot Devices: NEMA ICS 5, oiltight type.

C. Pilot Device Contacts: NEMA ICS 5, Form Z, rated A150.

D. Pushbuttons: Lockable type.

E. Indicating Lights: , LED type.

F. Selector Switches: Rotary type.

G. Relays: NEMA ICS 2, .

H. Control Power Transformers: 120 volt secondary, 50 VA minimum, in each enclosed contactor. Provide fused primary and secondary, and bond unfused leg of secondary to enclosure.

2.05 DISCONNECTS

A. Combination Contactors: Combine contactor with disconnect in common enclosure.

B. Disconnects: Thermal magnetic circuit breaker with integral thermal and instantaneous magnetic trip in each pole; UL listed.

C. Disconnects: Fusible switch assembly; NEMA KS 1, enclosed knife switch with externally operable handle. Fuse clips: Designed to accommodate Class R fuses.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install enclosed contactors where indicated, in accordance with manufacturer's instructions.

B. Install enclosed contactors plumb. Provide supports in accordance with Section 26 05 29.

C. Height: 5 ft to operating handle.

D. Provide fuses for fusible switches; refer to Section 26 28 13 for product requirements.

E. Provide engraved plastic nameplates; refer to Section 26 0553 for product requirements and location.

3.02 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00.

B. Inspect and test in accordance with NETA STD ATS, except Section 4.

C. Perform applicable inspections and tests listed in NETA STD ATS, Section 7.16.1.

END OF SECTION

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SECTION 26 09 23
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Occupancy sensors.

B. Time switches.

C. In-wall interval timers.

D. Outdoor photo controls.

E. Daylighting controls.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 37 - Boxes.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 09 19 - Enclosed Contactors: Lighting contactors.

F. Section 26 09 43 - Network Lighting Controls - Lutron.

G. Section 26 27 26 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, fan speed controllers, and wall plates.

H. Section 26 51 00 - Interior Lighting.

I. Section 26 56 00 - Exterior Lighting.

J. Section 01 91 00 - Commissioning

K. Section 01 91 10 - Functional Testing Procedures

L. Section 23 08 10 - Control Systems Commissioning

1.03 REFERENCE STANDARDS

A. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2010.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.

G. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.

H. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.

I. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.

3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
5. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:
1. Do not install lighting control devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

C. Shop Drawings:
1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.

D. Field Quality Control Reports.

E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Operation and Maintenance Data: Include detailed information on device programming and setup.

G. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all occupancy sensors.

C. Provide two year manufacturer warranty for all daylighting controls.

PART 2 PRODUCTS

2.01 ALL LIGHTING CONTROL DEVICES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

C. Products for Switching of Electronic Fluorescent Ballasts: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

2.02 OCCUPANCY SENSORS

A. Manufacturers:
   1. Hubbell Building Automation, Inc: www.hubbellautomation.com
   2. Lutron Electronics Company, Inc: www.lutron.com/#sle.
   3. Sensor Switch Inc: www.sensorswitch.com/#sle.
   4. WattStopper: www.wattstopper.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.
   6. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. All Occupancy Sensors:
   1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
   2. Sensor Technology:
      a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
   3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
   4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
   5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
   6. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
   7. Sensitivity: Field adjustable.
   8. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
   9. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
   10. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.

C. Wall Switch Occupancy Sensors:
   1. All Wall Switch Occupancy Sensors:
      a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
      b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).

c. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.

2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.
   a. Products:
      1) Hubbell Building Automation.
      2) Watt Stopper.
      3) Sensor switch.
      4) Substitutions: See Section 01 60 00 - Product Requirements.

D. Wall Dimmer Occupancy Sensors:
   1. General Requirements:
      a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability , and no leakage current to load in off mode.
      b. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
      c. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
      d. Provide field adjustable dimming preset for occupied state.

E. Ceiling Mounted Occupancy Sensors:
   1. All Ceiling Mounted Occupancy Sensors:
      a. Description: Low profile occupancy sensors designed for ceiling installation.
      b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
      c. Provide field selectable setting for disabling LED motion detector visual indicator.
      d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
      e. Finish: White unless otherwise indicated.
   2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
      a. Standard Range Sensors: Capable of detecting motion within an area of 2000 sqft at a mounting height of 9 feet, with a field of view of 360 degrees.
         1) Products:
            (a) Hubbell Building Automation.
            (b) Sensor Switch.
            (c) Watt Stopper.
            (d) Substitutions: See Section 01 60 00 - Product Requirements.

F. Power Packs for Low Voltage Occupancy Sensors:
   1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
   2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
   3. Input Supply Voltage: Dual rated for 120/277 V ac.
   4. Load Rating:
      a. Incandescent Load: Not less than 15 A.
      b. Fluorescent Load: Not less than 20 A.
      c. Motor Load: Not less than 1 HP.

2.03 TIME SWITCHES

A. Manufacturers:

1. Intermatic, Inc: www.intermatic.com/#sle.
2. Paragon, a brand of Invensys Controls: www.invensyscontrols.com.
3. Tork, a division of NSI Industries LLC: www.tork.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.
5. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. Digital Electronic Time Switches:
1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
2. Program Capability:
   a. Astronomic Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.
3. Schedule Capacity: Not less than 16 programmable on/off operations.
4. Provide automatic daylight savings time and leap year compensation.
5. Provide power outage backup to retain programming and maintain clock.
6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
7. Provide remote photocell input with light level adjustment.
8. Input Supply Voltage: As indicated on the drawings.
9. Output Switch Contact Ratings:
   a. Resistive Load: Not less than 30 A at 120-277 V ac.
   b. Tungsten Load: Not less than 5 A at 120 V ac.
   c. Inductive Load: Not less than 30 A at 120-277 V ac.
   d. Ballast Load: Not less than 20 A at 120 V ac or 6 A at 277 V ac.
   e. Motor Load: Not less than 1 HP at 120 V ac or 2 HP at 240 V ac.
10. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:
    a. Indoor clean, dry locations: Type 1.

C. Electromechanical Time Switches:
1. Description: Factory-assembled controller with motor-operated timing dial mechanism and adjustable trippers for setting on/off operations, listed and labeled as complying with UL 917.
2. Program Capability:
   a. 24-Hour Time Switches: With same schedule for each day of the week and skip-a-day feature to omit selected days.
3. Schedule Capacity:
   a. 24-Hour Time Switches: Accommodating not less than 12 pairs of selected on/off operations per day.
4. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
5. Input Supply Voltage: As indicated on the drawings.
6. Output Switch Configuration: As required to control the load indicated on drawings.
7. Output Switch Configuration: SPST dry unpowered maintained contacts.
8. Output Switch Contact Ratings: As required to control the load indicated on drawings.
9. Output Switch Contact Ratings:
   a. Resistive Load: Not less than 40 A at 120-277 V ac.
   b. Tungsten Load: Not less than 40 A at 120 V ac.
   c. Inductive Load: Not less than 20 A at 120-277 V ac.
   d. Motor Load: Not less than 1 HP at 120 V ac or 2 HP at 240 V ac.
10. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:

2.04 IN-WALL INTERVAL TIMERS

A. Manufacturers:
   1. Intermatic, Inc: www.intermatic.com/#sle.
   2. Paragon, a brand of Invensys Controls: www.invensyscontrols.com.
   3. Tork, a division of NSI Industries LLC: www.tork.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.
   5. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. Digital Electronic In-Wall Interval Timers:
   1. Description: Factory-assembled solid state programmable controller with LCD display, suitable for mounting in standard wall box, and listed and labeled as complying with UL 916 or UL 917.
   2. Program Capability: Designed to turn load off at end of preset time interval.
   3. Time Interval: Field selectable range of presets available up to 12 hours.
   4. Provide field selectable audible and visual indication to warn that end of interval operation is about to turn off load.
   5. Provide power outage backup to retain programming and maintain clock.
   6. Manual override: Capable of both turning load off and resetting timer to original preset time interval.
   7. Switch Configuration: Suitable for use in either SPST or 3-way application.
   8. Contact Ratings:
      a. Resistive Load: Not less than 20 A at 120-277 V ac.
      b. Tungsten Load: Not less than 15 A at 120 V ac.
      c. Ballast Load: Not less than 16 A at 120-277 V ac.
      d. Motor Load: Not less than 1 HP at 120 V ac or 2 HP at 240 V ac.

C. Spring Wound In-Wall Interval Timers:
   1. Description: Factory-assembled controller with mechanical spring wound timing mechanism requiring no electricity to operate; suitable for mounting in standard wall box; rotary control operator with matching wall plate factory marked with time interval units; listed and labeled as complying with UL 916 or UL 917.
   2. Program Capability: Designed to turn load off at end of preset time interval.
   3. Time Interval: User selectable from zero up to 15 minutes.
   4. Manual override: Provide hold feature to disable timer for constant on operation.
   5. Switch Configuration: SPST.
   6. Contact Ratings: As required to control the load indicated on drawings.
   7. Contact Ratings:
      a. Resistive Load: Not less than 20 A at 120 V ac or 10 A at 277 V ac.
      b. Inductive Load: Not less than 20 A at 120 V ac or 10 A at 277 V ac.
      c. Tungsten Load: Not less than 7 A at 120 V ac.
      d. Motor Load: Not less than 1 HP at 120 V ac or 2 HP at 250 V ac.

2.05 OUTDOOR PHOTO CONTROLS

A. Manufacturers:
   1. Intermatic, Inc: www.intermatic.com/#sle.
   2. Paragon, a brand of Invensys Controls: www.invensyscontrols.com.
   3. Tork, a division of NSI Industries LLC: www.tork.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Stem-Mounted Outdoor Photo Controls:
   1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
   2. Housing: Weatherproof, impact resistant polycarbonate.
   3. Photo Sensor: Cadmium sulfide.
   4. Provide external sliding shield for field adjustment of light level activation.

5. Light Level Activation: 1 to 5 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
6. Voltage: As required to control the load indicated on the drawings.
7. Failure Mode: Fails to the on position.
8. Load Rating: As required to control the load indicated on the drawings.
9. Provide accessory wall-mounting bracket where indicated or as required to complete installation.

2.06 DAYLIGHTING CONTROLS

A. Manufacturers:
   1. Hubbell Building Automation, Inc: www.hubbellautomation.com/#sle.
   2. Sensor Switch Inc: www.sensorswitch.com/#sle.
   3. WattStopper: www.wattstopper.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.
   5. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.

C. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.
   1. Sensor Type: Filtered silicon photo diode.
   2. Sensor Range:
      a. Indoor Photo Sensors: 5 to 100 footcandles.
   3. Finish: White unless otherwise indicated.
   4. Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.
   5. Wireless Daylighting Control Photo Sensors:
      a. RF Range: 30 feet through typical construction materials.
      b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 15, for Class B application.
      c. Power: Battery-operated with minimum ten-year battery life.

D. Dimming Photo Sensors: Photo sensor units with integral controller compatible with specified dimming ballasts, for direct continuous dimming of up to 50 ballasts.

E. Daylighting Control Switching Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors, for switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
   1. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
   2. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
   3. Control Capability:
      a. Multi-Zone Switching Modules: Capable of controlling up to three separately programmable channels.

F. Daylighting Control Switching Modules for Wireless Sensors:
   1. Description: Plenum rated, self-contained relay compatible with specified wireless photo sensors for switching of line voltage loads in response to changes in measured light levels according to selected settings.
   2. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
   3. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.

4. Control Capability: Capable of controlling one programmable channel.
5. Input Supply Voltage: Dual rated for 120/277 V ac.
6. Load Rating:
    a. General Purpose Load: Not less than 16 A.
    b. Motor Load: Not less than 1/2 HP (120V) and 1.5 HP (277V).

G. Daylighting Control Dimming Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors and with specified dimming ballasts, for both continuous dimming of compatible dimming ballasts and switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
    1. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
    2. Load to be turned off when available daylight is sufficient to fully dim the load, after the selected time delay.
    3. Control Capability: Capable of controlling up to three separately programmable channels, with up to 50 ballasts per channel.
    4. Dimming and Fade Rates: Adjustable from 5 to 60 seconds.
    5. Cut-Off Delay: Selectable and adjustable from 0 to 20 minutes.

H. Power Packs for Low Voltage Daylighting Control Modules:
    1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage daylighting control modules for switching of line voltage loads. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
    2. Input Supply Voltage: Dual rated for 120/277 V ac.
    3. Load Ratings: As required to control the load indicated on drawings.

I. Accessories:
    1. Where indicated, provide compatible accessory wall switches for manual override control.
    2. Where indicated, provide compatible accessory wireless controls for manual override control.
        a. Products:
            1) Hubbell Biuilding Automaiton.
            2) Sensor Switch.
            3) Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of lighting control devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switch Occupancy Sensors: 48 inches above finished floor.
      b. In-Wall Time Switches: 48 inches above finished floor.
      c. In-Wall Interval Timers: 48 inches above finished floor.
   2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
   3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 27 26.

G. Provide required supports in accordance with Section 26 05 29.

H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

I. Identify lighting control devices in accordance with Section 26 05 53.

J. Occupancy Sensor Locations:
   1. Location Adjustments: Do not make adjustments to locations without obtaining approval from the Architect.
   2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

K. Outdoor Photo Control Locations:
   1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
   2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

L. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

M. Daylighting Control Photo Sensor Locations:
   1. Location Adjustments: Do not make adjustments to locations without obtaining approval from the Architect.
   2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
   3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.

N. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

O. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

D. Test time switches to verify proper operation.

E. Test outdoor photo controls to verify proper operation, including time delays where applicable.

F. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.

G. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

D. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect. Record settings in written report to be included with submittals.

E. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.

F. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 COMMISSIONING

A. See Section 01 91 13 for commissioning requirements.

3.08 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration and Training: Manufacturer's representative to demonstrate proper operation of lighting control devices to Owner and Architect, and correct deficiencies or make adjustments as directed.

END OF SECTION

SECTION 26 12 00
MEDIUM-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Liquid-filled pad-mounted distribution transformers.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Pads for transformer support.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

A. IEEE 386 - IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 kV through 35 kV; 2016.

B. IEEE C57.12.00 - IEEE Standard for General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers; 2021.

C. IEEE C57.12.01 - IEEE Standard for General Requirements for Dry-Type Distribution and Power Transformers; 2020.

D. IEEE C57.12.28 - IEEE Standard for Pad-Mounted Equipment -- Enclosure Integrity; 2014.

E. IEEE C57.12.90 - IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers; 2021.

F. NEMA 260 - Safety Labels for Pad-Mounted Switchgear and Transformers Sited in Public Areas; 1996 (Reaffirmed 2019).

G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate electrical characteristics and connection requirements, outline dimensions, connection and support points, weight, specified ratings and materials.

C. Product Data: Provide electrical characteristics and connection requirements, standard model design tests, and options.

D. Manufacturer's Installation Instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer's Field Reports: Indicate activities on site, final adjustments and overcurrent protective device coordination curves, adverse findings, and recommendations.

G. Project Record Documents: Include copy of manufacturer's certified drawings.

H. Maintenance Data: Include maintenance instructions for cleaning methods; cleaning materials recommended; procedures for sampling and maintaining fluid.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect dry-type transformers from moisture by using appropriate heaters as instructed by the manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB/GE: www.electrification.us.abb.com/#sle.

B. Cooper Power Systems, a division of Eaton Corporation: www.cooperindustries.com/#sle.

C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LIQUID-FILLED TRANSFORMERS

A. Liquid-Filled Transformers: IEEE C57.12.00, three phase, pad-mounted, self-cooled transformer unit.

B. Cooling and Temperature Rise; IEEE C57.12.00; Class OA. 55 degrees C, self-cooled.

C. Insulating Liquid: Oil.

2.03 SERVICE CONDITIONS

A. Meet requirements for usual service conditions described in IEEE C57.12.01 and for the specified unusual service conditions.

B. Maximum Ambient Temperature: 110 degrees F.

C. Altitude: 50 feet.

2.04 RATINGS

A. Capacity: 1000 kVA.

B. Primary Voltage: 4.16 kV delta connected.

C. Taps: Standard primary taps.

D. Secondary Voltage: 480y/277 volts, wye connected.

E. Impedance: 5.75 percent maximum.

F. Basic Impulse Level: 95 kV.

2.05 ACCESSORIES

A. Accessories: IEEE C57.12.00 standard accessories.

B. Tap Changer: Externally-operated type.

C. Primary Terminations: Bushing wells to IEEE 386; provide six for loop feed. Include bushings for insulated loadbreak connectors.

D. Primary Overcurrent Protection: Internally-mounted, liquid-immersed, expulsion fuses.

E. Secondary Terminations: Spade lugs.

F. Other Accessories: Primary lightning arrestors.

2.06 FABRICATION

A. Comply with the requirements of IEEE C57.12.28.

2.07 FACTORY FINISHING

A. Clean surfaces before applying paint.

B. Apply corrosion-resisting primer to all surfaces.

C. Apply finish coat of baked enamel paint to 2 mils thick.

D. Finish Color: Manufacturer's standard dark gray finish.

2.08 SOURCE QUALITY CONTROL

A. Provide factory tests to IEEE C57.12.90 and IEEE C57.12.00. Include the routine tests as defined in the standards and the following other tests:
   1. Impedance voltage and load loss.
   2. Dielectric tests.
   3. Audible sound level.
   4. Short circuit capability.
   5. Zero-phase-sequence impedance voltage.
   6. Temperature rise.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that support pads provided under Section 03 30 00 are ready to receive products.

B. Verify that field measurements are as indicated on shop drawings.

3.02 INSTALLATION

A. Provide required support and attachment in accordance with Section 26 05 29.

B. Install plumb and level.

C. Install safety labels to NEMA 260.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.2. Tests listed as optional are not required.

3.04 ADJUSTING

A. Adjust primary taps so that secondary voltage is above and within 2 percent of rated voltage.

END OF SECTION

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SECTION 26 22 00
LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General purpose transformers.

B. K-factor transformers rated for nonlinear loads.

1.02 REFERENCE STANDARDS

A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.

B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.

C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.

F. NEMA ST 1 - Specialty Transformers (Except General Purpose Type); National Electrical Manufacturers Association; 1988 (R1997).

G. NEMA ST 20 - Dry Type Transformers for General Applications; 2021.

H. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.

L. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors required for mounting of transformers.

B. NEMA TR-1/ANSI 57.12.51 and 57.12.50

C. Federal Register - US department of Energy, Office of Energy Efficiency and Renewable Energy, 10 CFR Part 30, July 29, 2004. Energy Conservation Program for Commercial and Industrial Equipment, Energy Conservation Standards for Distribution Transformers, Proposed Rule.

D. ANSI/ASHRAE/IESNA 90.1 - Energy Efficient Design on New Buildings Except Low- Rise Residential Buildings.
   1. Transformer selection based on optimizing the combination of no-load, part-load, and full-load losses without compromising operational and reliability requirements for the building.

E. ANSI/NEMA TP-1 - Guide for Determining Energy Efficiency for Distribution Transformers.
   1. For Reference only. US DOE does not consider NEMA TP-1 efficiency levels to reflect low life cycle cost.

F. ANSI/NEMA TP-2 - Standard Test Method for Measuring Energy Consumption of Distribution Transformers.

G. IEEE C57.110-1998 - IEEE Recommended Practice for establishing transformer capability when feeding nonsinusoidal load currents.

1. Transformers losses increase in proportion to the mix of electronic equipment in the overall load fed from transformer.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.

C. Provide linear load efficiency data at 25 %, 35%, 50 %, 75 % , and 100 % full load.
   1. Vibration Isolators: Include attachment method and rated load and deflection.

D. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.

E. Product Data: Provide outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, and impedance ratings and characteristics, tap configurations, insulation system type, core and coil material and rated temperature rise.

F. Test Reports: Indicate loss data, efficiency at 0, 25, 50, 75 and 100 percent rated load, and sound level.

G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

H. Maintenance Data: Include recommended maintenance procedures and intervals.

I. Project Record Documents: Record actual locations of transformers.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

E. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

1.07 FIELD CONDITIONS

A. Ambient Temperature: Do not exceed the following maximum temperatures during and after installation of transformers.
   1. Greater than 10 kVA: 104 degrees F maximum.
   2. Less than 10 kVA: 77 degrees F maximum.

B. Ambient Temperature: Do not exceed 86 degrees F average or 104 degrees F maximum measured during any 24 hour period during and after installation of transformers.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. 5 year warranty on all transformers and appurtenances.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Schneider Electric; Square D Products; Premium 30 energy efficient: www.schneider-electric.us/#sle.

B. Eaton Electrical/Cutler-Hammer: www.eatonelectrical.com.

C. GE Industrial: www.geindustrial.com.

D. Powersmiths International Corp.

E. Substitutions: See Section 01 60 00 - Product Requirements.

F. Source Limitations: Furnish transformers produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ALL TRANSFORMERS

A. Description: High performance, energy efficient, copper wound transformer with 30 % less loses than NEMA TP_1 . Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
   1. Altitude: Less than 3,300 feet.
   2. Ambient Temperature:
      a. Greater than 10 kVA: Not exceeding 104 degrees F.
      b. Less than 10 kVA: Not exceeding 77 degrees F.
   3. Ambient Temperature: Not exceeding 86 degrees F average or 104 degrees F maximum measured during any 24 hour period.

C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.

E. Basic Impulse Level: 10 kV.

F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

G. Isolate core and coil from enclosure using vibration-absorbing mounts.

H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.03 GENERAL PURPOSE TRANSFORMERS

A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.

B. Primary Voltage: 480 volts delta, 3 phase.

C. Secondary Voltage: 208Y/120 volts, 3 phase 4 wire.

D. Insulation System and Allowable Average Winding Temperature Rise:
   1. 15 kVA and Larger: Class 220 degrees C insulation system with 115 degrees C average winding temperature rise.

E. Coil Conductors: Continuous copper windings with terminations brazed or welded.

F. Winding Taps:
   1. Less than 3 kVA: None.

2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.
3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.

G. Energy Efficiency: DOE 2016 energy efficiency levels.

H. Sound Levels: Low sound levels at least 5 db less than NEMA ST 20 standard sound levels.

I. Mounting Provisions:
1. Less than 15 kVA: Suitable for wall mounting.
2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
3. Larger than 75 kVA: Suitable for floor mounting.

J. Transformer Enclosure: Comply with NEMA ST 20.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor clean, dry locations: Type 2.
2. Construction: Heavy gage steel.
   a. Less than 15 kVA: Totally enclosed, non-ventilated.
   b. 15 kVA and Larger: Ventilated.
3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
4. Provide lifting eyes or brackets.

K. Accessories:
1. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.

L. Primary Voltage: 480 volts, 3 phase.

M. Secondary Voltage: 208Y/120 volts, 3 phase.

N. Insulation system and average winding temperature rise for rated kVA as follows:
1. 1-15 kVA: Class 185 with 115 degrees C rise, in a 40 C ambient setting.
2. 16-500 kVA: Class 220 with 115 degrees C rise, in a 40 C ambient setting.

O. Case Temperature: Do not exceed 35 degrees C rise above ambient at warmest point at full load.

P. Winding Taps:
1. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.
2. Transformers 15 kVA and Larger: Two 2-1/2% full capacity taps above and below normal primary voltage.

Q. Sound Levels: NEMA ST 20.

R. Energy Standard
1. Efficiency at 50% load is at least 0.9% higher than NEMA TP-1 for transformers up to 750 KVA.

S. Basic Impulse Level: 10 kV

T. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

U. Mounting:
1. 1-15 kVA: Suitable for wall mounting.
2. 16-75 kVA: Suitable for wall mounting.
3. Larger than 75 kVA: Suitable for floor mounting.

V. Coil Conductors: Continuous copper windings with terminations brazed or welded.

W. Transformer Enclosure: NEMA ST 20.
1. Type 1.
2. Ventilated.

3. Provide lifting eyes or brackets.
4. All terminals, including those for changing taps, must be readily accessible by removing front cover plates.

X. Isolate core and coil from enclosure using vibration-absorbing mounts.

Y. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.

2.04 K-FACTOR TRANSFORMERS RATED FOR NONLINEAR LOADS

A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 1561, and designed to supply nonlinear loads to the degree designated by the UL defined K-factor; ratings as indicated on the drawings.

B. Primary Voltage: 480 volts delta, 3 phase.

C. Secondary Voltage: 208Y/120 volts, 3 phase.

D. K-factor Rating: K-4, or higher.

E. Insulation System and Allowable Average Winding Temperature Rise: Class 220 degrees C insulation system with 115 degrees C average winding temperature rise.

F. Coil Conductors: Continuous copper windings with terminations brazed or welded. Individually insulate secondary conductors and arrange to minimize hysteresis and eddy current losses at harmonic frequencies. Size secondary neutral conductor at twice the secondary phase conductor ampacity.

G. Winding Taps: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.

H. Neutral Bus: Sized to accommodate twice the rated secondary current.

I. Energy Efficiency: Comply with DOE 2016 requirements.

J. Sound Levels: Standard sound levels complying with NEMA ST 20.

K. Mounting Provisions:
1. Up to 75 kVA: Suitable for wall, floor, or trapeze mounting.
2. Larger than 75 kVA: Suitable for floor mounting.

L. Electrostatic Shield: Provide grounded copper electrostatic shield between primary and secondary windings to attenuate electrical noise.

M. Transformer Enclosure: Comply with NEMA ST 20.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor clean, dry locations: Type 2.
2. Construction: Steel, ventilated.
3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
4. Provide lifting eyes or brackets.

N. Accessories:
1. Mounting Brackets: Provide manufacturer's standard brackets.
2. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.

2.05 SOURCE QUALITY CONTROL

A. Factory test transformers according to NEMA ST 20.

B. Production test each unit according to NEMA ST 20.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.

C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1.

B. Install transformers in accordance with manufacturer's instructions.

C. Install transformers in accordance with NECA 409 and IEEE C57.94.

D. Use flexible conduit, under the provisions of Section 26 05 34, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.

F. Set transformers plumb and level.

G. Use flexible conduit, under the provisions of Section 26 0534, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

H. Mount wall-mounted transformers using integral flanges or accessory brackets furnished by the manufacturer.

I. Mount floor-mounted transformers on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.

J. Mount floor-mounted transformers using vibration isolators suitable for isolating the transformer noise from the building structure.

K. Mount floor-mounted transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure.

L. Mount trapeze-mounted transformers as indicated.

M. Provide seismic restraints.

N. Provide grounding and bonding in accordance with Section 26 05 26.

O. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.

P. Where not factory-installed, install lugs sized as required for termination of conductors as shown on the drawings.

Q. Identify transformers in accordance with Section 26 05 53.

R. Install transformer identification nameplate in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Perform field inspection, testing, and adjusting in accordance with Section 01 40 00.

C. Inspect and test in accordance with NETA STD ATS, except Section 4.

D. Perform inspections and tests listed in NETA STD ATS, Section 7.2.1.1. In addition to the basic requirements of Section 7.2, include the following:
   1. Perform turns ratio tests at all tap positions.
   2. Verification that as-left tap connections are as specified.
   3. Perform excitation-current tests on each phase.
   4. Measure the resistance of each winding at each tap connection.
   5. Overpotential test on all high- and low-voltage windings-to-ground.

3.04 ADJUSTING

A. Measure primary and secondary voltages and make appropriate tap adjustments.

B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from transformer components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

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SECTION 26 24 13
SWITCHBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Switchboards.

B. Overcurrent protective devices for switchboards.

C. Switchboard accessories.

1.02 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendment (2017).

B. ANSI C12.1 - American National Standard Code for Electricity Metering; 2008.

C. ANSI C39.1 - American National Standard Requirements for Electrical Analog Indicating Instruments; 1981 (R1992).

D. IEC 60051-1 - Direct Acting Indicating Analogue Electrical Measuring Instruments and Their Accessories - Part 1: Definitions and General Requirements Common To All Parts;; 1997.

E. IEC 60051-2 - Direct Acting Indicating Analogue Electrical Measuring Instruments and Their Accessories - Part 2: Special Requirements for Ammeters and Voltmeters; 1984.

F. IEEE C12.1 - American National Standard Code for Electricity Metering; Institute of Electrical and Electronic Engineers; 1988.

G. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

H. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

I. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.

J. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

K. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

L. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.

M. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less; 2013.

N. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

O. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

P. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

Q. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

R. UL 891 - Switchboards; Current Edition, Including All Revisions.

S. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.
5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Service Entrance Switchboards:
1. Coordinate with Utility Company to provide switchboards with suitable provisions for electrical service and utility metering, where applicable.
2. Coordinate with Owner to arrange for Utility Company required access to equipment for installation and maintenance.
3. Obtain Utility Company approval of switchboard prior to fabrication.
4. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.
1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
1. Include dimensioned plan and elevation views of switchboards and adjacent equipment with all required clearances indicated.
2. Include wiring diagrams showing all factory and field connections.
3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
4. Include documentation of listed series ratings.
5. Include documentation demonstrating selective coordination.

D. Service Entrance Switchboards: Include documentation of Utility Company approval of switchboard.

E. Product Data: Provide electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of all equipment and components.

F. Shop Drawings: Indicate front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, neutral, and ground; and switchboard instrument details.

G. Test Reports: Indicate results of factory production tests.

H. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

I. Project Record Documents: Record actual locations of switchboards.

J. Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

K. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Enclosure Keys: Two of each different key.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.

B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.

C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

E. Deliver in 48 inch maximum width shipping splits, individually wrapped for protection and mounted on shipping skids.

F. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

G. Handle in accordance with NEMA PB 2.1 and manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.07 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Switchboards - Basis of Design: Schneider Electric co. QED power style switchboard.

B. Switchboards - Other Acceptable Manufacturers:
   1. Eaton Corporation: www.eaton.com.
   2. General Electric Company: www.geindustrial.com/#sle.

C. Substitutions: See Section 01 60 00 - Product Requirements.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Eaton Corporation; Cutler-Hammer Products: www.eaton.com.

F. Schneider Electric; Square D Products: www.schneider-electric.us.

G. Substitutions: See Section 01 60 00 - Product Requirements.

H. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

I. Source Limitations: Furnish switchboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 SWITCHBOARDS

A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.

D. Front-Connected Switchboards:
   1. Main Device(s): Individually-mounted.
   2. Feeder Devices: Panel/group-mounted.
   3. Arrangement: Front accessible only (not rear accessible), rear aligned.
   4. Gutter Access: Bolted covers.
   5. Basis of Design: Schneider Electric QED power style switchboard.

E. Service Entrance Switchboards:
   1. Listed and labeled as suitable for use as service equipment according to UL 869A.
   2. For solidly-grounded wye systems, provide factory-installed main bonding jumper between neutral and ground busses, and removable neutral disconnecting link for testing purposes.
   3. Comply with Utility Company requirements for electrical service.

F. Service Conditions:
   1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:
      a. Altitude: Less than 6,600 feet.
      b. Ambient Temperature:
         1) Switchboards Containing Molded Case or Insulated Case Circuit Breakers: Between 23 degrees F and 104 degrees F.
   2. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
      a. Altitude: 1000 feet.
      b. Ambient Temperature: Between 23 degrees F and 104 degrees F.

G. Short Circuit Current Rating:
   1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
   2. Minimum Rating: 65,000 rms symmetrical amperes.
   3. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.
   4. Label equipment utilizing series ratings as required by NFPA 70.

H. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

I. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.

J. Bussing: Sized in accordance with UL 891 temperature rise requirements.
   1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.
   2. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   3. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
   4. Phase and Neutral Bus Material: Copper.
   5. Ground Bus Material: Copper.

K. Conductor Terminations: Suitable for use with the conductors to be installed.
   1. Line Conductor Terminations:
      a. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
      b. Main and Neutral Lug Type: Mechanical.
   2. Load Conductor Terminations:

a. Lug Material: Copper, suitable for terminating copper conductors only.
b. Lug Type:
1) Provide mechanical lugs unless otherwise indicated.
2) Provide compression lugs where indicated.

L. Enclosures:
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
a. Indoor Clean, Dry Locations: Type 1 or Type 2 (drip-proof).
2. Finish: Manufacturer's standard unless otherwise indicated.

M. Future Provisions:
1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
2. Arrange and equip through bus and ground bus to accommodate future installation of additional switchboard sections.

N. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list switchboards as a complete assembly including surge protective device.

O. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
1. Where overcurrent protective devices equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.
a. Use zero sequence or residual ground fault detection method unless otherwise indicated.
b. Provide test panel and field-adjustable ground fault pick-up and delay settings.

P. Arc Flash Energy-Reducing Maintenance Switching: For circuit breakers rated 1200 A or higher, provide a local accessory switch with status indicator light that permits selection of a maintenance mode with alternate electronic trip unit settings for reduced fault clearing time.

Q. Owner Metering:
1. Provide microprocessor-based digital electrical metering system including all instrument transformers, wiring, and connections necessary for measurements specified.
2. Basis of Design: PM 8000.
3. Measured Parameters:
a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
b. Current (Amps): For each phase and neutral.
c. Frequency (Hz).
d. Real power (kW): For each phase, 3-phase total.
e. Reactive power (kVAR): For each phase, 3-phase total.
f. Apparent power (kVA): For each phase, 3-phase total.
g. Power factor.
h. Current demand.
i. Power demand: Real, reactive, and apparent.
4. Meter Accuracy: Plus/minus 1.0 percent.
5. Features:
a. Communications Capability: Compatible with system indicated. Provide all accessories necessary for proper interface.
b. Remote monitoring capability via PC.

R. Instrument Transformers:
1. Comply with IEEE C57.13.
2. Select suitable ratio, burden, and accuracy as required for connected devices.
3. Current Transformers: Connect secondaries to shorting terminal blocks.

4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

S. Description: NEMA PB 2 switchboard with electrical ratings and configurations as indicated and specified.

T. Ratings:
1. Voltage: 120/208; 277/480 volts.
2. Configuration: Three phase, four wire, grounded.
3. Main Bus: 3000 amps.277/480 v, 2000 amps, 208/120v .
4. Integrated Equipment Rating: 100000 rms amperes symmetrical.

U. Main Section Devices: Individually mounted and compartmented.

V. Distribution Section Devices: _Group mounted- double row sections.

W. Bus Material: Copper with tin plating, standard size.

X. Bus Connections: Bolted, accessible from front for maintenance.

Y. Fully insulate load side bus bars

Z. Ground Bus: Extend length of switchboard.

AA. Insulated Ground Bus: Extend length of switchboard.

AB. Molded Case Circuit Breakers: Integral thermal and instantaneous magnetic trip in each pole.
1. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
2. Include shunt trip where indicated.
3. Circuit Breakers 1- 400amp and up shall be provided with field replaceable trip unit.
4. All Feeder breakers in 208/120v switchboard shall be series rated for min. of 65 kAIC with 1-pole circuit breakers in all panelboards. All feeder breakers in 480y/277v ,3ph4w switchboard shall be series rated for min. of 65 KAIC.

AC. Solid-State Molded Case Circuit Breakers: With electronic sensing, timing and tripping circuits for adjustable current settings; UL listed.
1. Ground fault trip, ground fault sensing integral with circuit breaker.
2. Instantaneous trip.
3. Adjustable short time/ long time trip.
4. Stationary mounting.
5. Include shunt trip where indicated.

AD. Line and Load Terminations: Accessible from the front only of the switchboard, suitable for the conductor materials and sizes indicated.

AE. Ground Fault Sensor: Zero sequence type.

AF. Ground Fault Relay: Adjustable ground fault sensitivity from 200 to 1200 amperes, time delay adjustable from 0 to 15 seconds. Provide monitor panel with lamp to indicate relay operation, TEST and RESET control switches. Max time delay shall be one second for ground fault currents equal to or greater ethan 3000 amps.

AG. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, suitably insulated and braced for short circuit currents. Provide continuous current rating as indicated.

AH. Enclosure: Type _NEMA 1-Indoors.
1. Align sections at front and rear.
2. Switchboard Height: 91.5 inches, excluding floor sills, lifting members and pull boxes.
3. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.
4. Structure: Free standing, self supporting, totally front accessible.

2.03 OVERCURRENT PROTECTIVE DEVICES

A. Circuit Breakers:
1. Interrupting Capacity:

a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.

2. Molded Case Circuit Breakers:
   a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
      1) Provide thermal magnetic circuit breakers unless otherwise indicated.
      2) Provide electronic trip circuit breakers where indicated.
   b. Minimum Interrupting Capacity:
      1) 14000 rms symmetrical amperes at 240 VAC or 208 VAC.
      2) 21000 rms symmetrical amperes at 480 VAC.
   c. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
      1) Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes larger than 225 amperes.
   d. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
      1) Provide the following field-adjustable trip response settings:
         (a) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
         (b) Long time delay.
         (c) Short time pickup and delay.
         (d) Instantaneous pickup.
         (e) Ground fault pickup and delay where ground fault protection is indicated.
   e. Provide the following features and accessories where indicated or where required to complete installation:
      1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

2.04 SURGE PROTECTIVE DEVICES

A. See Section for factory-installed, internally mounted surge protective devices. List and label switchboards containing surge protective devices as a complete assembly including surge protective device.

2.05 POWER METERS

A. Manufacturers:
   1. SQ D PM 8000 or approved equal.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Watt-Hour Meters and Wattmeters: ANSI C12.1, three phase induction type with two stators, each with current and potential coil, rated 5 amperes and 120 volts at 60 Hertz.
   1. Meter suitable for connection to 3- and 4-wire circuits.
   2. Potential indicating lamps.
   3. Adjustments for light and full load, phase balance, and power factor.
   4. Digital register.
   5. Integral demand indicator.
   6. Ratchets to prevent reverse rotation.
   7. Removable meter with draw-out test plug.
   8. Semi-flush mounted case with matching cover.

9. BACnet gateway to provide connection to building automation system.

C. Provide meters with appropriate multiplier tags.

2.06 METERING TRANSFORMERS

A. Manufacturers:
   1. Square D or equal.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Current Transformers: IEEE C57.13, 5 ampere secondary, wound; bushing; bar or window type, with single secondary winding and secondary shorting device, primary/secondary ratio as required, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.

C. Potential Transformers: IEEE C57.13, 120 volt single secondary, disconnecting type with integral fuse mountings, primary/secondary ratio as required, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.

2.07 SOURCE QUALITY CONTROL

A. Factory test switchboards according to NEMA PB 2, including the following production (routine) tests on each switchboard assembly or component:
   1. Dielectric tests.
   2. Mechanical operation tests.
   3. Grounding of instrument transformer cases test.
   4. Electrical operation and control wiring tests, including polarity and sequence tests.
   5. Ground-fault sensing equipment test.

B. Shop inspect and test switchboard according to NEMA PB 2.

C. Make completed switchboard available for inspection at manufacturer's factory prior to packaging for shipment. Notify Owner at least 7 days before inspection is allowed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive switchboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide concrete housekeeping pad under the provisions of Section [].

B. Verify that field measurements are as instructed by manufacturer.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.

C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.

D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch between switchboard and wall.

E. Provide required support and attachment components in accordance with Section 26 05 29.

F. Install switchboards plumb and level.

G. Unless otherwise indicated, mount switchboards on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.

H. Provide grounding and bonding in accordance with Section 26 05 26.

I. Install all field-installed devices, components, and accessories.

J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

K. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 26 05 73.

L. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

M. Provide filler plates to cover unused spaces in switchboards.

N. Identify switchboards in accordance with Section 26 05 53.

O. Install switchboard in locations shown on drawings, according to NEMA PB 2.1.

P. Install in a neat and workmanlike manner, as specified in NECA 400.

Q. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

R. Identify switchboards in accordance with Section 26 05 53.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

C. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.

D. Perform field inspection and testing in accordance with Section .

E. Inspect and test in accordance with NETA STD ATS, except Section 4.

F. Perform inspections and tests listed in NETA STD ATS, Section 7.1.

G. Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 225 amperes. Tests listed as optional are not required.

H. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
   1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.

I. Meters: Perform inspections and tests listed in NETA ATS, Section 7.11.2.

J. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10.

K. Test shunt trips to verify proper operation.

L. Correct deficiencies and replace damaged or defective switchboards or associated components.

3.05 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of switchboard covers and doors.

C. Adjust all operating mechanisms for free mechanical movement.

D. Tighten bolted bus connections in accordance with manufacturer's instructions.

E. Adjust circuit breaker trip and time delay settings to values indicated.

F. Adjust circuit breaker trip and time delay settings to values as instructed by Architect.

3.06 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.

C. Touch up scratched or marred surfaces to match original finish.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

3.08 PROTECTION

A. Protect installed switchboards from subsequent construction operations.

END OF SECTION

SECTION 26 24 16
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.02 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendment (2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).

F. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

G. NEMA PB 1 - Panelboards; 2011.

H. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

L. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

M. UL 67 - Panelboards; Current Edition, Including All Revisions.

N. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

O. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

P. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

Q. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

R. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
   4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
   1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include wiring diagrams showing all factory and field connections.
   2. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Panelboard Keys: Two of each different key.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.07 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
   1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

1.08 MAINTENANCE MATERIALS

A. See Section 01 6000 - Product Requirements, for additional provisions.

B. Furnish two of each panelboard key.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation; Cutler-Hammer Products: www.eaton.com/#sle.

B. General Electric Company: www.geindustrial.com/#sle.

C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

D. Substitutions: See Section 01 60 00 - Product Requirements.

E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ALL PANELBOARDS

A. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
   2. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.
   3. Label equipment utilizing series ratings as required by NFPA 70.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
   3. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
      c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.

d. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable continuous hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

4. Lockable Doors: All locks keyed alike unless otherwise indicated.
5. Metal frame for type written directory

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K. Panelboard Contactors: Where panelboard contactors are indicated, provide electrically operated, mechanically held magnetic contactor complying with NEMA ICS 2.
1. Ampere Rating: Not less than ampere rating of panelboard bus.
2. Short Circuit Current Rating: Not less than the panelboard short circuit current rating.
3. Coil Voltage: As required for connection to control system indicated.

L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.

M. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

2.03 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Products:
1. SQ D .
2. General Electric.
3. Eaton Cutler Hammer.
4. Substitutions: See Section 01 60 00 - Product Requirements.

C. Conductor Terminations:
1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
2. Main and Neutral Lug Type: Mechanical.

D. Bussing:
1. Phase and Neutral Bus Material: Copper.
2. Ground Bus Material: Copper.

E. Circuit Breakers:
1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
2. Provide thermal magnetic circuit breakers unless otherwise indicated.
3. Provide electronic trip circuit breakers where indicated.

F. Enclosures:
1. Provide surface-mounted enclosures unless otherwise indicated.
2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable continuous hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide metal circuit directory holder mounted on inside of door.

G. Manufacturers:
1. SQ.D or Equal.
2. Substitutions: See Section 01 60 00 - Product Requirements.

H. Description: NEMA PB 1, circuit breaker type.

I. Service Conditions:
1. Altitude: 1000 feet.
2. Temperature: 55 degrees F.

J. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.

K. Minimum integrated short circuit rating: As indicated.
   1. 240 Volt Panelboards: 14,000 amperes rms symmetrical (minimum).
   2. 480 Volt Panelboards: 21,000 amperes rms symmetrical (minimum).

L. Molded Case Circuit Breakers: With integral thermal and instantaneous magnetic trip in each pole; UL listed. For air conditioning equipment branch circuits provide circuit breakers UL listed as Type HACR.

M. Molded Case Circuit Breakers with Current Limiters: With replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole; UL listed.

N. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.

O. Enclosure: NEMA PB 1, Type 1, 5 34" deep, 20" wide, cabinet box. With continued hinge and lock.

P. Cabinet Front: Surface type, fastened with [], [] [] finished in manufacturer's standard [] enamel.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Products:
   1. SQD.
   2. General Electric.
   3. Eaton Cutler Hammer.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

C. Conductor Terminations:
   1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
   2. Main and Neutral Lug Type: Mechanical.

D. Bussing:
   1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
   2. Phase and Neutral Bus Material: Copper.
   3. Ground Bus Material: Copper.

E. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

F. Enclosures:
   1. Provide surface-mounted or flush-mounted enclosures as indicated.
   2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable continuous hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   3. Provide metal circuit directory holder mounted on inside of door.

G. Manufacturers:
   1. SQ.D or Equal.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

H. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

I. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard; provide insulated ground bus where scheduled.

J. Minimum Integrated Short Circuit Rating: As indicated.
   1. 240 Volt Panelboards: 14,000 amperes rms symmetrical (minimum).
   2. 480 Volt Panelboards: 21,000 amperes rms symmetrical (minimum).

K. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type, with common trip handle for all poles; UL listed.
   1. Type SWD for lighting circuits.

2. Type HACR for air conditioning equipment circuits.
3. Class A ground fault interrupter circuit breakers where scheduled.
4. Do not use tandem circuit breakers, or miniature circuit breakers.

L. Enclosure: NEMA PB 1, Type 1.

M. Cabinet Box: 6 inches deep, 20 inches wide for 240 volt and less panelboards, 20 inches wide for 480 volt panelboards.

N. Cabinet Front: Flush or Surface cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

2.05 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
1) 14000 rms symmetrical amperes at 240 VAC or 208 VAC.
2) 21000 rms symmetrical amperes at 480 VAC.
b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
3. Conductor Terminations:
a. Provide mechanical lugs unless otherwise indicated.
b. Lug Material: Copper, suitable for terminating copper conductors only.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes larger than 225 amperes.
b. Provide interchangeable trip units where indicated.
5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
a. Provide the following field-adjustable trip response settings:
1) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
2) Long time delay.
3) Short time pickup and delay.
4) Instantaneous pickup.
5) Ground fault pickup and delay where ground fault protection is indicated.
6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
7. Provide the following circuit breaker types where indicated:
a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
8. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
9. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.
10. Do not use tandem circuit breakers.
11. Do not use handle ties in lieu of multi-pole circuit breakers.

2.06 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install panelboards securely, in a neat and workmanlike manner in accordance with NECA 1 (general workmanship), NECA 407 (panelboards), and NEMA PB 1.1.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 26 05 29.

E. Install panelboards plumb.

F. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

H. Mount floor-mounted power distribution panelboards on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.

I. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

J. Provide grounding and bonding in accordance with Section 26 05 26.
   1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
   2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.

K. Install all field-installed branch devices, components, and accessories.

L. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 05 73.

M. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

N. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.

O. Install panelboards plumb. Install recessed panelboards flush with wall finishes, where installed surface mounted secure or anchor panelboard to brick or cinder block wall.

P. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.

Q. Provide filler plates to cover unused spaces in panelboards.

R. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
   1. Emergency and night lighting circuits.
   2. Fire detection and alarm circuits.
   3. Communications equipment circuits.

4. Intrusion detection and access control system circuits.
5. Video surveillance system circuits.

S. Identify panelboards in accordance with Section 26 05 53.

T. Provide computer-generated circuit directory for each lighting and appliance panelboard and each power distribution panelboard provided with a door, clearly and specifically indicating the loads served. Identify spares and spaces.

U. Provide identification nameplate for each panelboard in accordance with Section 26 0553.

V. Provide arc flash warning labels in accordance with NFPA 70.

W. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.
1. Minimum spare conduits: 5 empty 1 inch.

X. Ground and bond panelboard enclosure according to Section 26 0526.

3.03 FIELD QUALITY CONTROL

A. Perform inspection, testing, and adjusting in accordance with Section 01 40 00.

B. Perform field inspection and testing in accordance with Section 01 4000.

C. Inspect and test in accordance with NETA STD ATS, except Section 4.

D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

E. Test GFCI circuit breakers to verify proper operation.

F. Test shunt trips to verify proper operation.

G. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.

H. Correct deficiencies and replace damaged or defective panelboards or associated components.

I. Perform inspections and tests listed in NETA STD ATS, Section 7.5 for switches, Section 7.6 for circuit breakers.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 27 17
EQUIPMENT WIRING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

A. Section 26 05 34 - Conduit.

B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables (600 V and Less).

C. Section 26 05 37 - Boxes.

D. Section 26 27 26 - Wiring Devices.

1.03 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2012.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide wiring device manufacturer’s catalog information showing dimensions, configurations, and construction.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 COORDINATION

A. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

B. Determine connection locations and requirements.

C. Sequence rough-in of electrical connections to coordinate with installation of equipment.

D. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Conform to NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
   4. Product:
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Disconnect Switches: As specified in Section and in individual equipment sections.

C. Wiring Devices: As specified in Section 26 27 26.

D. Flexible Conduit: As specified in Section 26 05 34.

E. Wire and Cable: As specified in Section 26 05 19.

F. Boxes: As specified in Section 26 05 37.

2.02 EQUIPMENT CONNECTIONS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

J. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Wall plates.

E. Floor box service fittings.

1.02 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 35 - Surface Raceways: Surface raceway systems, including multioutlet assemblies.

D. Section 26 05 37 - Boxes.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 09 23 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.

G. Section 26 27 17 - Equipment Wiring: Cords and plugs for equipment.

H. Section 26 29 13 - Enclosed Controllers: Manual motor starters and horsepower rated motor-starting switches without overload protection.

I. Section 27 10 05 - Structured Cabling for Voice and Data - Inside-Plant: Voice and data jacks.

1.03 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification; Revision G, 2001.

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F, 1999.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2012.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

L. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
6. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:
1. Do not install wiring devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Operation and Maintenance Data:
1. GFCI Receptacles: Include information on status indicators.

E. Project Record Documents: Record actual installed locations of wiring devices.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Wall Plates: One of each style, size, and finish.
3. Extra Flush Floor Service Fittings: Two of each type.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

1.08 EXTRA MATERIALS

A. See Section 01 6000 - Product Requirements, for additional provisions.

B. Furnish two of each style, size, and finish wall plate.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hubbell Incorporated; : www.hubbell-wiring.com.

B. Leviton Manufacturing Company, Inc; : www.leviton.com.

C. Lutron Electronics Company, Inc: www.lutron.com.

D. Pass & Seymour, a brand of Legrand North America, Inc; : www.legrand.us

E. Cooper Wiring Devices: www.cooperwiringdevices.com.

F. Leviton Manufacturing, Inc: www.leviton.com.

G. Substitutions: See Section 01 60 00 - Product Requirements.

H. Source Limitations: Where possible, for each type of wiring device furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFI receptacles with specified weatherproof covers for all receptacles installed outdoors or in damp or wet locations.

D. Provide GFI protection for all receptacles installed within 6 feet of sinks.

E. Provide GFCI protection for receptacles serving electric drinking fountains.

F. Unless noted otherwise, do not use combination switch/receptacle devices.

G. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.03 ALL WIRING DEVICES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.04 WALL SWITCHES

A. Manufacturers:
   1. Hubbell Incorporated; : www.hubbell-wiring.com.
   2. Leviton Manufacturing Company, Inc; : www.leviton.com/#sle.
   3. Pass & Seymour, a brand of Legrand North America, Inc; : www.legrand.us/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. All Wall Switches: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Commercial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

D. Wall Switches: Heavy Duty, AC only general-use snap switch, complying with NEMA WD 6 and WD 1.
   1. Body and Handle: Black plastic with toggle handle.
   2. Ratings:
      a. Voltage: 120 - 277 volts, AC.
      b. Current: 20 amperes.
   3. Ratings: Match branch circuit and load characteristics.

E. Switch Types: Single pole, double pole, 3-way, and 4-way.

2.05 WALL DIMMERS

A. Manufacturers:
   1. Leviton Manufacturing Company, Inc; _____: www.leviton.com/#sle.
   2. Lutron Electronics Company, Inc; Maestro Series: www.lutron.com.
   3. Pass & Seymour, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.

4. Substitutions: See Section 01 60 00 - Product Requirements.

B. All Wall Dimmers: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

C. Control: Slide control type with separate on/off switch.

2.06 RECEPTACLES

A. Manufacturers:
1. Hubbell Incorporated; : www.hubbell-wiring.com.
2. Leviton Manufacturing Company, Inc; : www.leviton.com/#sle.
3. Pass & Seymour, a brand of Legrand North America, Inc; : www.legrand.us/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. All Receptacles: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:
1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, tamper resistant; single or duplex as indicated on the drawings.
a. Products:
1) Hubbell Wiring Devices.
2) Leviton.
3) Pass & Saymore.
4) Substitutions: See Section 01 60 00 - Product Requirements.

D. GFI Receptacles:
1. All GFI Receptacles: Provide with feed-through protection, light to indicate ground fault tripped condition and loss of protection, and list as complying with UL 943, class A.
2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, tamper resistant.

E. Receptacles: Heavy duty, complying with NEMA WD 6 and WD 1.
1. Device Body: Black plastic.
2. Configuration: NEMA WD 6, type as specified and indicated.
3. Tamper resistant type.

F. Convenience Receptacles: Type 5 - 20.

G. Single Convenience Receptacles.

H. Duplex Convenience Receptacles.

I. GFCI Receptacles: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

2.07 TELEPHONE JACKS

A. Product: AMP manufacturing

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.08 WALL PLATES

A. Manufacturers:
1. Hubbell Incorporated; : www.hubbell-wiring.com/#sle.
2. Leviton Manufacturing Company, Inc; : www.leviton.com/#sle.
3. Pass & Seymour, a brand of Legrand North America, Inc; : www.legrand.us/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. All Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard; .
   3. Screws: Metal with slotted heads finished to match wall plate finish.

C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

D. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

E. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

F. Decorative Cover Plates: stainless steel.

G. Jumbo Cover Plates: stainless steel.

H. Weatherproof Cover Plates: Gasketed cast metal with hinged cover.

2.09 FLOOR BOX SERVICE FITTINGS

A. Manufacturers:
   1. Hubbell Incorporated; : www.hubbell-wiring.com.
   2. Thomas & Betts Corporation; : www.tnb.com/#sle.
   3. Wiremold, a brand of Legrand North America, Inc; : www.legrand.us/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Service fittings compatible with floor boxes provided under Section 26 05 37 with all components, adapters, and trims required for complete installation.

C. Flush Floor Service Fittings:
   1. Dual Service Flush Combination Outlets:
      a. Cover: Rectangular.
      b. Configuration:
         1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).
         2) Communications: Two Data Drops.
         3) Voice and Data Jacks: As specified in Section 27 10 05.
   2. Accessories:
      a. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

2.10 POKE-THROUGH ASSEMBLIES

A. Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.

B. Flush Floor Service Fittings:
   1. Dual Service Flush Combination Outlets:
      a. Cover: Hinged door(s).
      b. Configuration:
         1) Power: One standard convenience duplex receptacle(s).
         2) Communications: Two data drops..
         3) Voice and Data Jacks: As specified in Section 27 10 05.
   2. Accessories:
      a. Closure Plugs: Size and fire rating as required to seal unused core hole and maintain fire rating of floor.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that openings in access floor are in proper locations.

H. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Perform work in a neat and workmanlike manner in accordance with NECA 1, including mounting heights specified in that standard unless otherwise indicated.

C. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of wiring devices provided under this section.
   1. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   2. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

D. Install wiring devices in accordance with manufacturer's instructions.

E. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

F. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

G. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

H. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

I. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.

J. Unless otherwise indicated, GFCI receptacles may be connected to provide feed-through protection to downstream devices. Label such devices to indicate they are protected by upstream GFCI protection.

K. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

L. Install wiring devices plumb and level with mounting yoke held rigidly in place.

M. Install wall switches with OFF position down.

N. Do not share neutral conductor on branch circuits utilizing wall dimmers.

O. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

P. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

Q. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

R. Identify wiring devices in accordance with Section 26 05 53.

S. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

T. Install receptacles with grounding pole on top.

U. Connect wiring device grounding terminal to outlet box with bonding jumper.

V. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

W. Connect wiring devices by wrapping conductor around screw terminal.

X. Use jumbo size plates for outlets installed in masonry walls.

Y. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 26 05 37 to obtain mounting heights.

B. Install wall switch 48 inches above finished floor.

C. Install convenience receptacle 18 inches above finished floor.

D. Install convenience receptacle 6 inches above backsplash of counter.

E. Install telephone jack 18 inches above finished floor.

F. Install telephone jack for side-reach wall telephone to position top of telephone at 54 inches above finished floor.

G. Install telephone jack for forward-reach wall telephone to position top of telephone at 48 inches above finished floor.

H. Coordinate installation of access floor boxes with access floor system provided under Section 09 6900.

I. Coordinate the installation of wiring devices with underfloor duct service fittings provided under Section 26 0540.

3.05 FIELD QUALITY CONTROL

A. Perform field inspection, testing, adjusting, and balancing in accordance with Section 01 40 00.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D. Operate each wall switch with circuit energized and verify proper operation.

E. Verify that each receptacle device is energized.

F. Test each receptacle to verify operation and proper polarity.

G. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

H. Correct wiring deficiencies and replace damaged or defective wiring devices.

I. Verify that each telephone jack is properly connected and circuit is operational.

3.06 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.07 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 26 28 13
FUSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fuses.

1.02 RELATED REQUIREMENTS

A. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

B. Section 26 05 73 - Overcurrent Protective Device Coordination Study: Additional criteria for the selection of protective devices specified in this section.

C. Section 26 24 13 - Switchboards: Fusible switches.

D. Section 26 24 16 - Panelboards: Fusible switches.

E. Section 26 28 18 - Enclosed Switches: Fusible switches.

F. Section 26 29 13 - Enclosed Controllers: Fusible switches.

1.03 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

D. UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses; Current Edition, Including All Revisions.

E. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
      a. Fusible Switches for Enclosed Motor Controllers: See Section 26 29 13.
   2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
   3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Fuses: One set(s) of three for each type and size installed.
   3. Fuse Pullers: One set(s) compatible with each type and size installed.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.

E. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.07 MAINTENANCE MATERIALS

A. See Section 01 6000 - Product Requirements, for additional provisions.

B. Furnish two fuse pullers.

C. Furnish three of each size and type fuse installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cooper Bussmann, a division of Cooper Industries: www.cooperindustries.com/#sle.

B. Mersen (formerly Ferraz Shawmut): ferrazshawmut.mersen.com.

C. Littelfuse, Inc: www.littelfuse.com/#sle.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 APPLICATIONS

A. Service Entrance:
   1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.

B. General Purpose Branch Circuits: Class RK1, time-delay.

C. Primary Protection for Control Transformers: Class CC, time-delay.

2.03 FUSES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose indicated.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.

H. Class CC Fuses: Comply with UL 248-4.

I. Power Load Feeder Switches: Class RK1 (time delay).

J. Motor Load Feeder Switches: Class RK1 (time delay).

K. Other Feeder Switches: Class RK1 (time delay).

L. General Purpose Branch Circuits: Class RK1 (time delay).

M. Motor Branch Circuits: Class L time delay.

N. Lighting Branch Circuits: Class G.

2.04 CLASS RK1 (TIME DELAY) FUSES

A. Manufacturers:
   1. Bussman Corp.

2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Construction: Current limiting, dual-element fuse, 10 seconds minimum at 500% rated amps, with copper fuse element.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

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SECTION 26 28 17
ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed circuit breakers.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 05 73 - Overcurrent Protective Device Coordination Study: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendment (2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

J. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

K. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
   2. Include documentation of listed series ratings.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Maintain one copy of each document on site.

D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed circuit breaker internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature between 23 degrees F and 104 degrees F during and after installation of enclosed circuit breakers.

1.09 EXTRA MATERIALS

A. See Section 01 6000 - Product Requirements, for additional provisions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation; Cutler-Hammer Products: www.eaton.com/#sle.

B. General Electric Company: www.geindustrial.com/#sle.

C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

D. Substitutions: See Section 01 60 00 - Product Requirements.

E. Source Limitations: Furnish enclosed circuit breakers and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED CIRCUIT BREAKERS

A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

B. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature: Between 23 degrees F and 104 degrees F.

D. Short Circuit Current Rating:
   1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location indicated on the drawings.
   2. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.
   3. Label equipment utilizing series ratings as required by NFPA 70.

E. Enclosed Circuit Breakers Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

F. Conductor Terminations: Suitable for use with the conductors to be installed.

G. Provide thermal magnetic circuit breakers unless otherwise indicated.

H. Provide electronic trip circuit breakers where indicated.

I. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

J. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
   3. Provide surface-mounted enclosures unless otherwise indicated.

L. Provide externally operable handle with means for locking in the OFF position.

M. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
   1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
   2. Where accessory ground fault sensing and relaying equipment is used, equip companion circuit breakers with ground-fault shunt trips.
      a. Use zero sequence ground fault detection method unless otherwise indicated.
      b. Provide test panel and field-adjustable ground fault pick-up and delay settings.

2.03 MOLDED CASE CIRCUIT BREAKERS

A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

B. Interrupting Capacity:
   1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      a. 14000 min. rms symmetrical amperes at 240 VAC or 208 VAC.
      b. 21000 min. rms symmetrical amperes at 480 VAC.
   2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   3. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.

C. Conductor Terminations:
   1. Provide mechanical lugs unless otherwise indicated.
   2. Lug Material: Copper, suitable for terminating copper conductors only.

D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   1. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
   2. Provide interchangeable trip units for circuit breaker frame sizes 225 amperes and larger.

E. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
   1. Provide the following field-adjustable trip response settings:
      a. Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
      b. Long time delay.
      c. Short time pickup and delay.
      d. Instantaneous pickup.
      e. Ground fault pickup and delay where ground fault protection is indicated.

F. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

G. Provide the following circuit breaker types where indicated:
   1. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.

H. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.

I. Provide the following features and accessories where indicated or where required to complete installation:
   1. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

J. Molded Case Circuit Breakers: UL listed for the following service conditions:
   1. Temperature: 95 degrees F.
   2. Altitude: 1000 feet.

2.04 TRIP UNITS

A. Field-Adjustable Trip Circuit Breakers: Provide circuit breakers with frame sizes 200 amperes and larger with mechanism for adjusting long time continuous current, short time pickup current setting for automatic operation. Range of Adjustment: amperes.

B. Field-Changeable Ampere Rating Circuit Breaker: Provide circuit breakers with frame sizes 250 amperes and larger with changeable trip units.

C. Current Limiting Circuit Breaker: Provide circuit breaker as indicated with automatically-resetting current limiting elements in each pole. Let-through Current and Energy: Less than permitted for same size Class RK-5 fuse.

D. Solid-State Circuit Breaker: Provide circuit breaker as scheduled with electronic sensing, timing and tripping circuits for adjustable current settings; ground fault trip with zero sequence type ground fault sensor; instantaneous trip.

2.05 CURRENT LIMITERS

A. Current Limiters: Designed for application with molded case circuit breaker.

B. Coordinate limiter size with trip rating of circuit breaker to prevent nuisance tripping and to achieve interrupting current rating specified for circuit breaker.

C. Provide interlocks to trip circuit breaker and to prevent closing circuit breaker when limiter compartment cover is removed or when one or more limiter is not in place or has operated.

2.06 ACCESSORIES

A. Enclosures:
   1. Fabricate enclosures from steel.
   2. Finish: Manufacturer's standard enamel finish, gray color.

B. Provide accessories as scheduled.

C. Handle Lock: Include provisions for padlocking.

D. Provide mechanical trip device.

E. Provide grounding lug in each enclosure.

F. Provide products suitable for use as service entrance equipment where so applied.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install enclosed circuit breakers where indicated, in accordance with manufacturer's instructions.

B. Install enclosed circuit breakers securely, in a neat and workmanlike manner in accordance with NECA 1.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 26 05 29.

E. Install enclosed circuit breakers plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 05 26.

H. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

I. Height: 5 feet to operating handle.

J. Provide identification nameplates for each enclosed circuit breaker in accordance with Section 26 0553.

K. Provide arc flash warning labels in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

A. Perform inspection, testing, and adjusting in accordance with Section 01 40 00.

B. Inspect and test in accordance with manufacturer's instructions and NETA STD ATS, except Section 4.

C. Perform inspections and tests listed in NETA STD ATS, Section 7.6.1.1 for circuit breakers used for service entrance and for circuit breakers larger than 400 amperes. Tests listed as optional are not required.

D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

E. Test GFCI circuit breakers to verify proper operation.

F. Test shunt trips to verify proper operation.

G. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

H. Perform field inspection and testing in accordance with Section 01 4000.

I. Inspect and test each circuit breaker.

J. Inspect each circuit breaker visually.

K. Perform several mechanical ON-OFF operations on each circuit breaker.

L. Verify circuit continuity on each pole in closed position.

M. Determine that circuit breaker will trip on overcurrent condition, with tripping time to NEMA AB 1 requirements.

N. Include description of testing and results in test report.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 28 18
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

B. Fusible switches.

C. Nonfusible switches.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 05 73 - Overcurrent Protective Device Coordination Study: Additional criteria for the selection of equipment and associated protective devices specified in this section.

E. Section 26 28 13 - Fuses.

F. Section 26 29 13 - Enclosed Controllers: Manual motor controllers.

G. Section 26 36 00 - Transfer Switches: Automatic and non-automatic switches listed for use as transfer switch equipment.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

C. NEMA FU 1 - Low Voltage Cartridge Fuses; National Electrical Manufacturers Association; 2002 (R2007).

D. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

E. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

I. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. Project Record Documents: Record actual locations of enclosed switches.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation; Cutler-Hammer Products; Model : www.eaton.com/#sle.

B. General Electric Company; Model : www.geindustrial.com/#sle.

C. Schneider Electric; Square D Products; Model : www.schneider-electric.us/#sle.

D. Substitutions: See Section 01 60 00 - Product Requirements.

E. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:

G. Provide with switch blade contact position that is visible when the cover is open.

H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.

I. Conductor Terminations: Suitable for use with the conductors to be installed.

J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.

L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

M. Heavy Duty Switches:
   1. Products:
      a. Schneider Electric.
      b. General Electric Co.
      c. Cutler Hammer.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Comply with NEMA KS 1.
   3. Conductor Terminations:
      a. Provide mechanical lugs unless otherwise indicated.
      b. Provide compression lugs where indicated.
      c. Lug Material: Copper, suitable for terminating copper conductors only.
   4. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

2.03 COMPONENTS

A. Fusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
   1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
   2. Handle lockable in OFF position.
   3. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses.

B. Nonfusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.

1. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
2. Handle lockable in OFF position.

C. Enclosures: NEMA KS 1.
1. Interior Dry Locations: Type 1.
2. Exterior Locations: Type 3R.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install enclosed switches in accordance with manufacturer's instructions.

B. Install enclosed switches securely, in a neat and workmanlike manner in accordance with NECA 1.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 26 05 29.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 05 26.

H. Provide fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

I. Provide identification nameplate for each enclosed switch in accordance with Section 26 0553.

J. Provide arc flash warning labels in accordance with NFPA 70.

K. Install fuses in fusible disconnect switches.

L. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection, testing, and adjusting in accordance with Section 01 40 00.

B. Inspect and test in accordance with NETA STD ATS, except Section 4.

C. Perform inspections and tests listed in NETA STD ATS, Section 7.5.1.1.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

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SECTION 26 29 13
ENCLOSED CONTROLLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Magnetic motor controllers.

B. Combination magnetic motor controllers and disconnects.

1.02 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

C. Section 26 28 13 - Fuses.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000, with Errata (2008).

C. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; 2017.

D. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).

E. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

F. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 33 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

C. Test Reports: Indicate field test and inspection procedures and test results.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Maintenance Data: Replacement parts list for controllers.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.

C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation; Cutler-Hammer Product: www.eaton.com/#sle.

B. General Electric Company: www.geindustrial.com/#sle.

C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 AUTOMATIC CONTROLLERS

A. Magnetic Motor Controllers: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower.

B. Coil Operating Voltage: 120 volts, 60 Hertz.

C. Overload Relays: NEMA ICS 2; bimetal.

D. Enclosures: NEMA ICS 6, Type 1.

2.03 ACCESSORIES

A. Auxiliary Contacts: NEMA ICS 2, 2 normally open contacts in addition to seal-in contact.

B. Cover Mounted Pilot Devices: NEMA ICS 5, standard duty oiltight type.

C. Pilot Device Contacts: NEMA ICS 5, Form Z, rated A150.

D. Indicating Lights: Transformer, LED type.

E. Selector Switches: Rotary type.

F. Relays: NEMA ICS 2.

G. Control Power Transformers: 120 volt secondary, 50 VA minimum, in each motor starter. Provide fused primary, secondary, and bond unfused leg of secondary to enclosure.

2.04 DISCONNECTS

A. Combination Controllers: Combine motor controllers with disconnects in common enclosure. Obtain IEC Class 2 coordinated component protection.

B. Fusible Switch Assemblies: NEMA KS 1, enclosed knife switch with externally operable handle. Fuse clips: Designed to accommodate Class R fuses.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install enclosed controllers where indicated, in accordance with manufacturer's instructions.

B. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

C. Provide supports in accordance with Section 26 05 29.

D. Height: 5 ft to operating handle.

E. Provide fuses for fusible switches; refer to Section 26 28 13 for product requirements.

F. Select and install overload heater elements in motor controllers to match installed motor characteristics.

G. Identify enclosed controllers in accordance with Section 26 05 53.

3.02 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 45 00.

B. Inspect and test in accordance with NETA STD ATS, except Section 4.

C. Perform inspections and tests listed in NETA STD ATS, Section 7.16.1.

END OF SECTION

SECTION 26 29 23
VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Variable frequency controllers.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Housekeeping pads.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

C. Section 26 28 13 - Fuses.

1.03 REFERENCE STANDARDS

A. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable-Speed Drive Systems; 2022.

B. NEMA ICS 61800-2 - Adjustable Speed Electrical Power Drive Systems, Part 2: General Requirements-Rating Specifications for Low Voltage Adjustable Frequency AC Power Drive Systems; 2005.

C. NEMA ICS 7 - Industrial Control and Systems: Adjustable-Speed Drives; 2020.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

E. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

C. Shop Drawings: Indicate front and side views of enclosures with overall dimensions and weights shown; conduit entrance locations and requirements; and nameplate legends.

D. Test Reports: Indicate field test and inspection procedures and test results.

E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Manufacturer's Field Reports: Indicate start-up inspection findings.

G. Operation Data: NEMA ICS 7.1. Include instructions for starting and operating controllers, and describe operating limits that may result in hazardous or unsafe conditions.

H. Maintenance Data: NEMA ICS 7.1. Include routine preventive maintenance schedule.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.

C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB: www.ABB.com.

B. Schneider Electric; Square D Products: www.schneider-electric.us.

C. Danfoss: www.danfoss.us.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DESCRIPTION

A. Variable Frequency Controllers: Enclosed controllers suitable for operating the indicated loads, in conformance with requirements of NEMA ICS 7. Select unspecified features and options in accordance with NEMA ICS 3.1.
   1. Employ pulse-width-modulated inverter system.
   2. Design for ability to operate controller with motor disconnected from output.
   3. Design to attempt five automatic restarts following fault condition before locking out and requiring manual restart.

B. Enclosures: NEMA 250, Type 1, suitable for equipment application in places regularly open to the public.

C. Finish: Manufacturer's standard enamel.

2.03 OPERATING REQUIREMENTS

A. Rated Input Voltage: 480 volts, three phase, 60 Hertz.

B. Motor Nameplate Voltage: 460 volts, three phase, 60 Hertz.

C. Displacement Power Factor: Between 1.0 and 0.95, lagging, over entire range of operating speed and load.

D. Operating Ambient: 0 degrees C to 40 degrees C.

E. Minimum Efficiency at Full Load: 85 percent.

F. Time to Stop: 5 seconds.

G. Volts Per Hertz Adjustment: Plus or minus 0 percent.

H. Current Limit Adjustment: 60 to 110 percent of rated.

I. Acceleration Rate Adjustment: 0.5 to 30 seconds.

J. Deceleration Rate Adjustment: 1 to 30 seconds.

K. Input Signal: 4 to 20 mA DC.

2.04 COMPONENTS

A. Display: Provide integral digital display to indicate output voltage, output frequency, and output current.

B. Status Indicators: Separate indicators for overcurrent, overvoltage, ground fault, overtemperature, and input power ON.

C. Furnish HAND-OFF-AUTOMATIC selector switch and manual speed control.

D. Include undervoltage release.

E. Control Power Source: Integral control transformer.

F. Door Interlocks: Furnish mechanical means to prevent opening of equipment with power connected, or to disconnect power if door is opened; include means for defeating interlock by qualified persons.

G. Safety Interlocks: Furnish terminals for remote contact to inhibit starting under both manual and automatic mode.

H. Control Interlocks: Furnish terminals for remote contact to allow starting in automatic mode.

I. Manual Bypass: Furnish contactor, motor running overload protection, and short circuit protection for full voltage, non-reversing operation of the motor. Include isolation switch to allow maintenance of inverter during bypass operation.

J. Emergency Stop: Use dynamic brakes for emergency stop function.

K. Disconnecting Means: Include integral fused disconnect switch on the line side of each controller.

L. Wiring Terminations: Match conductor materials and sizes indicated.

M. Line Reactor: Furnish line reactor (s) for harmonics mitigation.

2.05 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Factory test controllers in accordance with NEMA ICS 61800-2.

C. Shop inspect and perform standard productions tests for each controller.

D. Make completed controller available for inspection at manufacturer's factory prior to packaging for shipment. Notify Owner at least 7 days before inspection is allowed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surface is suitable for controller installation.

B. Do not install controller until building environment can be maintained within the service conditions required by the manufacturer.

C. Verify that field measurements are as indicated on shop drawings.

3.02 INSTALLATION

A. Install in accordance with NEMA ICS 7.1 and manufacturer's instructions.

B. Tighten accessible connections and mechanical fasteners after placing controller.

C. Provide fuses in fusible switches; refer to Section 26 28 13 for product requirements.

D. Select and install overload heater elements in motor controllers to match installed motor characteristics.

E. Identify variable frequency controllers in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. Provide the service of the manufacturer's field representative to prepare and start controllers.

B. Perform field inspection and testing in accordance with Section 01 40 00.

C. Inspect and test in accordance with NETA STD ATS, except Section 4.

D. Perform inspections and tests listed in NETA STD ATS, Section 7.17.

E. Correct deficiencies and replace damaged or defective controllers or associated components.

3.04 ADJUSTING

A. Make final adjustments to installed controller to assure proper operation of load system. Obtain performance requirements from installer of driven loads.

3.05 CLOSEOUT ACTIVITIES

A. Demonstrate operation of controllers in automatic and manual modes.

3.06 MAINTENANCE

A. See Section 01 70 00 - Execution Requirements, for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

C. Provide service and maintenance of controllers for one year from Date of Substantial Completion.

END OF SECTION

SECTION 26 32 13
ENGINE GENERATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged engine generator system and associated components and accessories:
   1. Engine and engine accessory equipment.
   2. Alternator (generator).
   3. Generator set control system.
   4. Generator set enclosure.

B. Packaged engine generator set.

C. Heat exchanger.

D. Exhaust silencer, emissions controls, and fittings.

E. Remote control panel.

F. Battery and charger.

G. Sound enclosure.

H. Portable Generator Loading Dock

1.02 REFERENCE STANDARDS

A. ASTM D975 - Standard Specification for Diesel Fuel; 2023.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NECA/EGSA 404 - Standard for Installing Generator Sets; 2014.

D. NEMA MG 1 - Motors and Generators; 2014.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.

F. NFPA 30 - Flammable and Combustible Liquids Code; 2018.

G. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines; 2021.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. NFPA 99 - Health Care Facilities Code; 2015.

J. NFPA 110 - Standard for Emergency and Standby Power Systems; 2022.

K. UL 142 - Steel Aboveground Tanks for Flammable and Combustible Liquids; Current Edition, Including All Revisions.

L. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries; Current Edition, Including All Revisions.

M. UL 2200 - Stationary Engine Generator Assemblies; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.
      a. Transfer Switches: See Section 26 36 00.
   2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.
   3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.

5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week before starting work of this section; require attendance of all affected installers.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.
   1. Include generator set sound level test data.
   2. Include characteristic trip curves for overcurrent protective devices upon request.
   3. Include alternator thermal damage curve upon request.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

D. Specimen Warranty: Submit sample of manufacturer's warranty.

E. Evidence of qualifications for installer.

F. Evidence of qualifications for maintenance contractor (if different entity from installer).

G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

H. Manufacturer's factory emissions certification.

I. Manufacturer's certification that products meet or exceed specified requirements.

J. Source quality control test reports.

K. Provide NFPA 110 required documentation from manufacturer where requested by authorities having jurisdiction, including but not limited to:
   1. Certified prototype tests.
   2. Torsional vibration compatibility certification.
   3. NFPA 110 compliance certification.
   4. Certified rated load test at rated power factor.

L. Manufacturer’s detailed field testing procedures.

M. Field quality control test reports.

N. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
   1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

O. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

P. Maintenance contracts.

Q. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

R. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Fuses: One of each type and size.
   3. Extra Filter Elements: One of each type, including fuel, oil and air.

S. Shop Drawings: Indicate electrical characteristics and connection requirements. Show plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, electrical diagrams including schematic and interconnection diagrams.

T. Product Data: Provide data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, day tank, and remote radiator.

U. Test Reports: Indicate results of performance testing.

V. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

W. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

X. Manufacturer's Field Reports: Indicate procedures and findings.

Y. Operation Data: Include instructions for normal operation.

Z. Maintenance Data: Include instructions for routine maintenance requirements, service manuals for engine and day tank, oil sampling and analysis for engine wear, and emergency maintenance procedures.

AA. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
1. Extra Filter Elements: One of each type, including fuel, oil and air.
2. Tools: One set of tools required for preventative maintenance of the engine generator system. Package tools in adequately sized metal tool box.

1.05 QUALITY ASSURANCE

A. Comply with the following:
1. NFPA 70 (National Electrical Code).
2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for Level 1 system.
3. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).
4. NFPA 30 (Flammable and Combustible Liquids Code).

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
1. Authorized service facilities located within 200 miles of project site.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with engine generator systems of similar size, type, and complexity; manufacturer's authorized installer.

E. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.
1. Contract maintenance office located within 200 miles of project site.

F. Products: Listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authorities having jurisdiction as suitable for the purpose indicated.

G. Conform to requirements of NFPA 70.
1. Maintain one copy of each document on site.

H. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience with service facilities within 100 miles of Project.

I. Supplier Qualifications: Authorized distributor of specified manufacturer with minimum three years documented experience.

J. Products: Furnish products listed and classified by Underwriters Laboratories as suitable for purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store generator sets in accordance with manufacturer's instructions and NECA/EGSA 404.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to generator set components, enclosure, and finish.

1.07 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

C. Accept unit on site on skids. Inspect for damage.

D. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Packaged Engine Generator Set - Basis of Design: Kohler Power Systems; Model 200 REOZJF

B. Substitutions: See Section 01 60 00 - Product Requirements.

C. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

D. Source Limitations: Furnish engine generator sets and associated components and accessories produced by a single manufacturer and obtained from a single supplier.

E. Caterpillar Inc: www.caterpillar.com.

F. Cummins Engine Company, I: www.cummins.com.

G. Kohler Power Systems: www.kohler.com.

H. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PACKAGED ENGINE GENERATOR SYSTEM

A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. System Description:
   1. Application: _Stand by.
   2. Configuration: Single packaged engine generator set operated independently (not in parallel).

D. Packaged Engine Generator Set:
   1. Type: Diesel (compression ignition).

2. Basis of Design: Kohler Power Systems Model 200 REOZJF.
3. Power Rating: As indicated on drawings, standby.
4. Voltage: As indicated on drawings.
5. Main Line Circuit Breaker:
   a. Type: Thermal magnetic.
   b. Trip Rating: Select according to generator set rating.
   c. Features:

E. Generator Set General Requirements:
1. Prototype tested in accordance with NFPA 110 for Level 1 systems.
2. Factory-assembled, with components mounted on suitable base.
3. List and label engine generator assembly as complying with UL 2200.
4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
6. Main Line Circuit Breakers: Provide factory-installed line side connections with suitable lugs for load side connections.

F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.
1. Altitude: 1000 feet.
2. Ambient Temperature: Between 0 and 104 degrees F.

G. Starting and Load Acceptance Requirements:
1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.
2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.
3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
4. Maximum Load Step: Supports 100 percent of rated load in one step.

H. Exhaust Emissions Requirements:
1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.
2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.

I. Sound Level Requirements:
1. Do not exceed 69 dBA when measured at 23 feet from generator set in free field (no sound barriers) while operating at full load; include manufacturer's sound data with submittals.

J. Description: NFPA 110, engine generator system to provide source of power for Level 1 applications conforming to NFPA 99.

K. System Capacity: 200 kW, 250 kVA at elevation of 100 feet above sea level, continuous rating using engine-mounted radiator.

2.03 ENGINE AND ENGINE ACCESSORY EQUIPMENT

A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.

B. Engine Fuel System - Diesel (Compression Ignition):
1. Fuel Source: Diesel, ASTM D975 No. 2-D or approved cold weather diesel blends.
2. Fuel Storage: Sub-base fuel tank.

3. Engine Fuel Supply: Provide engine-driven, positive displacement fuel pump with replaceable fuel filter(s), water separator, check valve to secure prime, manual fuel priming pump, and relief-bypass valve. Provide fuel cooler where recommended by manufacturer.
4. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.
5. Sub-Base Fuel Tank:
    a. Provide sub-base mounted, double-wall fuel tank with secondary containment; listed and labeled as complying with UL 142.
    b. Tank Capacity: Size for minimum of 24 hours of continuous engine generator operation at 100 percent rated load, but not larger than permissible by applicable codes.
    c. Features:
        1) Direct reading fuel level gauge.
        2) Normal atmospheric vent.
        3) Emergency pressure relief vent.
        4) Fuel fill opening with lockable cap.
        5) Dedicated electrical conduit stub-up area.

C. Engine Starting System:
1. System Type: Electric, with DC solenoid-activated starting motor(s).
2. Battery(s):
    a. Battery Type: Lead-acid.
    b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.
    c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.
3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.
4. Battery Charger:
    a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.
    b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.
    c. Recognized as complying with UL 1236.
    d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.
    e. Provide integral DC output ammeter and voltmeter with five percent accuracy.
    f. Provide alarm output contacts as necessary for alarm indications.
5. Battery Heater: Provide thermostatically controlled battery heater to improve starting under cold ambient conditions.

D. Engine Speed Control System (Governor):
1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.
2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.

E. Engine Lubrication System:
1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.

2. Oil Heater: Provide thermostatically controlled oil heater to improve starting under cold ambient conditions.

F. Engine Cooling System:
1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.
2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.

G. Engine Air Intake and Exhaust System:
1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.
2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.
3. Exhaust Silencer: Provide critical grade or better exhaust silencer with sound attenuation not less than basis of design; select according to manufacturer's recommendations to meet sound performance requirements, where specified.

H. Rating: Sufficient to operate under 10 percent overload for one hour in an ambient of 90 degrees F at elevation of 1000 feet.

I. Fuel System: No. 2 fuel oil. Include manufacturer's approved regulator for pressure reduction from supply pressure.

J. Engine speed: 1800 rpm.

K. Governor: Isochronous type to maintain engine speed within 0.5 percent, steady state, and 5 percent, no load to full load, with recovery to steady state within 2 seconds following sudden load changes. Equip governor with means for manual operation and adjustment.

L. Safety Devices: Engine shutdown on high water temperature, low oil pressure, overspeed, and engine overcrank. Limits as selected by manufacturer.

M. Engine Starting: DC starting system with positive engagement, number and voltage of starter motors in accordance with manufacturer's instructions. Include remote starting control circuit, with MANUAL-OFF-REMOTE selector switch on engine-generator control panel.

N. Engine Jacket Heater: Thermal circulation type water heater with integral thermostatic control, sized to maintain engine jacket water at 90 degrees F, and suitable for operation on 120 volts AC.

O. Radiator: Radiator using glycol coolant, with blower type fan, sized to maintain safe engine temperature in ambient temperature of 110 degrees F. Radiator air flow restriction 0.5 inches of water maximum.

P. Engine Accessories: Fuel filter, lube oil filter, intake air filter, lube oil cooler, fuel transfer pump, fuel priming pump, gear-driven water pump. Include fuel pressure gage, water temperature gage, and lube oil pressure gage on engine/generator control panel.

Q. Mounting: Provide unit with suitable spring-type vibration isolators and mount on structural steel base.

2.04 ALTERNATOR (GENERATOR)

A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 1; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.

B. Exciter:
1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.
2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.
3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.

C. Temperature Rise: Comply with UL 2200.

D. Insulation System: NEMA MG 1, Class H; suitable for alternator temperature rise.

E. Enclosure: NEMA MG 1, drip-proof.

F. Total Harmonic Distortion: Not greater than five percent.

G. Alternator Heater: Provide strip heater to prevent moisture condensation on alternator windings.

2.05 GENERATOR SET CONTROL SYSTEM

A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.

B. Control Panel:
   1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.
   2. Generator Set Control Functions:
      a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).
      b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.
      c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.
      d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.
      e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.
      f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).
      g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.
   3. Generator Set Status Indications:
      a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
      b. Current (Amps): For each phase.
      c. Frequency (Hz).
      d. Real power (W/kW).
      e. Reactive power (VAR/kVAR).
      f. Apparent power (VA/kVA).
      g. Power factor.
      h. Duty Level: Actual load as percentage of rated power.
      i. Engine speed (RPM).
      j. Battery voltage (Volts DC).
      k. Engine oil pressure.
      l. Engine coolant temperature.
      m. Engine run time.
      n. Generator powering load (position signal from transfer switch).
   4. Generator Set Protection and Warning/Shutdown Indications:
      a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:
         1) Overcrank (shutdown).
         2) Low coolant temperature (warning).
         3) High coolant temperature (warning).
         4) High coolant temperature (shutdown).
         5) Low oil pressure (shutdown).
         6) Overspeed (shutdown).
         7) Low fuel level (warning).
         8) Low coolant level (warning/shutdown).
         9) Generator control not in automatic mode (warning).
         10) High battery voltage (warning).
         11) Low cranking voltage (warning).
         12) Low battery voltage (warning).
         13) Battery charger failure (warning).

b. In addition to NFPA 110 requirements, provide the following protections/indications:
   1) High AC voltage (shutdown).
   2) Low AC voltage (shutdown).
   3) High frequency (shutdown).
   4) Low frequency (shutdown).
   5) Overcurrent (shutdown).
c. Provide contacts for local and remote common alarm.
d. Provide lamp test function that illuminates all indicator lamps.

5. Other Control Panel Features:
   a. Event log.
   b. Communications Capability: Compatible with system indicated. Provide all accessories necessary for proper interface.
   c. Remote monitoring capability via PC.

C. Remote Annunciator:
1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.
2. Generator Set Status Indications:
   a. Generator powering load (via position signal from transfer switch).
   b. Communication functional.
3. Generator Set Warning/Shutdown Indications:
   a. Comply with NFPA 110 for Level 1 systems including but not limited to the following indications:
      1) Overcrank (shutdown).
      2) Low coolant temperature (warning).
      3) High coolant temperature (warning).
      4) High coolant temperature (shutdown).
      5) Low oil pressure (shutdown).
      6) Overspeed (shutdown).
      7) Low fuel level (warning).
      8) Low coolant level (warning/shutdown).
      9) Generator control not in automatic mode (warning).
      10) High battery voltage (warning).
      11) Low cranking voltage (warning).
      12) Low battery voltage (warning).
      13) Battery charger failure (warning).
   b. Provide audible alarm with silence function.
   c. Provide lamp test function that illuminates all indicator lamps.

D. Remote Emergency Stop: Provide approved red, mushroom style remote emergency stop button where indicated or required by authorities having jurisdiction.

2.06 GENERATOR SET ENCLOSURE

A. Enclosure Type: Sound attenuating, weather protective.

B. Enclosure Material: Steel.

C. Hardware Material: Stainless steel.

D. Color: Manufacturer's standard.

E. Access Doors: Lockable, with all locks keyed alike.

F. Openings: Rodent barrier designed to prevent bird/rodent entry.

G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.

H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating material.

I. Exhaust Silencers: Where exhaust silencers are mounted within enclosure in main engine compartment, insulate silencer to minimize heat dissipation as necessary for operation at rated load under worst case ambient temperature.

J. Enclosure Space Heater: Provide thermostatically controlled enclosure space heater to prevent condensation and improve starting under cold ambient conditions; size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature.

2.07 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Perform production tests on generator sets at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

C. Generator Set production testing to include, at a minimum:
1. Operation at rated load and rated power factor.
2. Single step load pick-up.
3. Transient and steady state voltage and frequency performance.
4. Operation of safety shutdowns.

D. Diesel Fuel Storage Tanks: Perform pressurized leak test prior to shipment.

E. Generator: NEMA MG 1, three phase, four pole, reconnectable brushless synchronous generator with brushless exciter.

F. Insulation Class: F.

G. Temperature Rise: 130 degrees C Standby.

H. Enclosure: Sound attenuating, weather protective.

I. Voltage Regulation: Include generator-mounted volts per hertz exciter-regulator to match engine and generator characteristics, with voltage regulation plus or minus 1 percent from no load to full load. Include manual controls to adjust voltage droop, voltage level (plus or minus 5 percent) and voltage gain.

2.08 ACCESSORIES

A. Heat Exchanger: Engine or base-mounted heat exchanger and expansion tank of type and capacity recommended by engine manufacturer. Include solenoid shut-off valve for installation on the cooling water inlet, and connected to open when engine runs.

B. Exhaust Silencer: Residential type silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, sized in accordance with engine manufacturer's instructions.

C. Batteries: Heavy duty, diesel starting type lead-acid storage batteries, 170 ampere-hours minimum capacity. Match battery voltage to starting system. Include necessary cables and clamps.

D. Battery Tray: Treated for electrolyte resistance, constructed to contain spillage.

E. Battery Charger: Current limiting type designed to float at 2.17 volts per cell and equalize at 2.33 volts per cell. Include overload protection, full wave rectifier, DC voltmeter and ammeter, and 120 volts AC fused input. Provide wall-mounted enclosure to meet NEMA 250, Type 1 requirements.

F. Line Circuit Breaker: Molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole, sized in accordance with NFPA 70; UL listed. Include battery-voltage operated shunt trip, connected to open circuit breaker on engine failure. Unit mount in enclosure to meet NEMA 250, Type 1 requirements.

G. Engine-Generator Control Panel: NEMA 250, Type 1 generator mounted control panel enclosure with engine and generator controls and indicators. Include provision for padlock and the following equipment and features:
1. Frequency Meter: 45-65 Hz. range, 3.5 inch dial.
2. AC Output Voltmeter: 3.5 inch dial, 2 percent accuracy, with phase selector switch.

3. AC Output Ammeter: 3.5 inch dial, 2 percent accuracy, with phase selector switch.
4. Output voltage adjustment.
5. Push-to-test indicator lamps, one each for low oil pressure, high water temperature, overspeed, and overcrank.
6. Engine start/stop selector switch.
7. Engine running time meter.
8. Oil pressure gage.
9. Water temperature gage.
10. Auxiliary Relay: 3PDT, operates when engine runs, with contact terminals prewired to terminal strip.
11. Additional visual indicators and alarms as required by NFPA 110.
12. Remote Alarm Contacts: Pre-wire SPDT contacts to terminal strip for remote alarm functions required by NFPA 110.

H. Remote Annunciator Panel: Surface mounted panel with brushed stainless steel. Provide audible and visible indicators and alarms required by NFPA 110.

I. Emissions controls: Catalyst based, meeting State of Delaware Department of Natural Resources and Environmental Controls standards for stand-by generators.

J. Sound Enclosure: Lift based steel construction with hinged doors. Accoustic insulation meeting UL94HF1 flammability classification and repels moisture absorption. Maximum sound level shall be 69 dB at 23.1 ft.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive equipment.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1.

B. Install products in accordance with manufacturer's instructions.

C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.

D. Arrange equipment to provide minimum clearances and required maintenance access.

E. Unless otherwise indicated, mount generator set on properly sized 6 inch high concrete pad constructed in accordance with Section 03 30 00. Provide suitable vibration isolators, where not factory installed.

F. Provide required support and attachment in accordance with Section 26 05 29.

G. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.

H. Provide diesel fuel piping and venting in accordance with Section 23 11 13, where not factory installed.

I. Provide engine exhaust piping in accordance with Section 23 51 00, where not factory installed.
1. Include piping expansion joints, piping insulation, thimble, condensation trap/drain, rain cap, hangers/supports, etc. as indicated or as required.
2. Do not exceed manufacturer's maximum back pressure requirements.

J. Do not insulate piping for engine components restricted by manufacturer.

K. Install exhaust silencer in accordance with Section 23 51 00, where not factory installed.

L. Provide grounding and bonding in accordance with Section 26 05 26.

M. Identify system wiring and components in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to prepare and start systems and perform inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

C. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.

D. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

E. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.

F. Preliminary inspection and testing to include, at a minimum:
   1. Inspect each system component for damage and defects.
   2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
   3. Check for proper oil and coolant levels.

G. Prepare and start system in accordance with manufacturer's instructions.

H. Perform acceptance test in accordance with NFPA 110.

I. Inspection and testing to include, at a minimum:
   1. Verify compliance with starting and load acceptance requirements.
   2. Verify voltage and frequency; make required adjustments as necessary.
   3. Verify phase sequence.
   4. Verify control system operation, including safety shutdowns.
   5. Verify operation of auxiliary equipment and accessories (e.g. battery charger, heaters, etc.).

J. Provide field emissions testing where necessary for certification.

K. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

L. Submit detailed reports indicating inspection and testing results and corrective actions taken.

M. Provide the services of manufacturer's representative to prepare and start system.

N. Perform field inspection and testing in accordance with Section 01 4000.

O. Provide full load test utilizing portable test bank, if required, for four hours minimum. Simulate power failure including operation of transfer switch, automatic starting cycle, and automatic shutdown and return to normal.

P. Record in 20 minute intervals during four hour test:
   1. Kilowatts.
   2. Amperes.
   3. Voltage.
   4. Coolant temperature.
   5. Room temperature.
   6. Frequency.
   7. Oil pressure.

Q. Test alarm and shutdown circuits by simulating conditions.

R. Field-verify emissions levels to meet manufacturer's documented criteria per submittals.

3.04 ADJUSTING

A. Adjust generator output voltage and engine speed.

3.05 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

C. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of four hours of training.
   3. Instructor: Manufacturer's authorized representative.
   4. Location: At project site.

3.07 PROTECTION

A. Protect installed engine generator system from subsequent construction operations.

B. Demonstrate operation to Owner's operating personnel:
   1. Describe loads connected to emergency system and restrictions for future load additions.
   2. Simulate power outage by interrupting normal source, and demonstrate that system operates to provide emergency power.

3.08 MAINTENANCE

A. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of engine generator system for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

B. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 4 hours of notification.
   2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

C. Maintain an on-site log listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced.

D. Provide a separate maintenance contract for specified maintenance service.

E. Provide service and maintenance of engine generator for 2 years from Date of Substantial Completion.

END OF SECTION

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SECTION 26 36 00
TRANSFER SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:
   1. Automatic transfer switches.
   2. Remote annunciators.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

C. NEMA ICS 10 Part 1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment; 2020.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 110 - Standard for Emergency and Standby Power Systems; 2022.

G. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.
   2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work with placement of supports, anchors, etc. required for mounting.
   5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week before starting work of this section; require attendance of all affected installers.

C. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.
   1. Where applicable, include characteristic trip curves for overcurrent protective devices upon request.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

E. Manufacturer's certification that products meet or exceed specified requirements.

F. Source quality control test reports.

G. Manufacturer’s detailed field testing procedures.

H. Field quality control test reports.

I. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
   1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

J. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

K. Maintenance contracts.

L. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

M. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

N. Product Data: Provide catalog sheets showing voltage, switch size, ratings and size of switching and overcurrent protective devices, operating logic, short circuit ratings, dimensions, and enclosure details.

O. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

P. Operation Data: Instructions for operating equipment under emergency conditions when engine generator is running.

Q. Maintenance Data: Routine preventative maintenance and lubrication schedule. List special tools, maintenance materials, and replacement parts.

1.05 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70 (National Electrical Code).
   2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for system Level specified in Section 26 32 13.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
   1. Authorized service facilities located within 200 miles of project site.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with power transfer systems of similar size, type, and complexity; manufacturer's authorized installer.

E. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

G. Conform to requirements of NFPA 70.

H. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.

I. Supplier Qualifications: Authorized distributor of specified manufacturer with minimum three years documented experience.

J. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store transfer switches in accordance with manufacturer's instructions.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to transfer switch components, enclosure, and finish.

1.07 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum two year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Transfer Switches - Basis of Design: ASCO power technologies 300 series..

B. Eaton Corporation; Cutler-Hammer Products: www.eaton.com.

C. Substitutions: See Section 01 60 00 - Product Requirements.

D. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

E. Source Limitations: Furnish transfer switches and accessories produced by a single manufacturer and obtained from a single supplier.

2.02 TRANSFER SWITCHES

A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Applications:
   1. Utilize open transition transfer unless otherwise indicated or required.

D. Construction Type: Either "contactor type" (open contact) or "breaker type" (enclosed contact) transfer switches complying with specified requirements are acceptable.

E. Automatic Transfer Switch:
   1. Basis of Design: ASCO transfer swithces 300 series, .

F. Comply with NEMA ICS 10 Part 1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).

G. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.

H. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.

I. Switching Methods:
   1. Open Transition:
      a. Provide break-before-make transfer without a neutral position that is not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.
   2. Obtain control power for transfer operation from line side of source to which the load is to be transferred.

J. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.
   1. Altitude: 1000 feet.
   2. Ambient Temperature: Between 0 degrees F and 104 degrees F.

K. Enclosures:
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1 or Type 12.
      b. Outdoor Locations: Type 3R or Type 4.
   2. Provide lockable door(s) for outdoor locations.
   3. Finish: Manufacturer's standard unless otherwise indicated.

L. Short Circuit Current Rating:
   1. Withstand and Closing Rating: Provide transfer switches, when protected by the supply side overcurrent protective devices to be installed, with listed withstand and closing rating not less than the available fault current at the installed location as indicated on the drawings.

M. Automatic Transfer Switches:
   1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.
   2. Control Functions:
      a. Automatic mode.
      b. Test Mode: Simulates failure of primary/normal source.
      c. Voltage and Frequency Sensing:
         1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.
         2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.
         3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.
      d. Outputs:
         1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).
         2) Auxiliary contacts; one set(s) for each switch position.
      e. Adjustable Time Delays:
         1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.
         2) Transfer to alternate/emergency source time delay.
         3) Retransfer to primary/normal source time delay.
         4) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.
      f. In-Phase Monitor (Open Transition Transfer Switches): Monitors phase angle difference between sources for initiating in-phase transfer.
      g. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.

3. Status Indications:
    a. Connected to alternate/emergency source.
    b. Connected to primary/normal source.
    c. Alternate/emergency source available.
4. Automatic Sequence of Operations:
    a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.
    b. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.
    c. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.
    d. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.

N. Remote Annunciators:
1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.
2. Transfer Switch Status Indications:
    a. Connected to alternate/emergency source.
    b. Connected to primary/normal source.
    c. Alternate/emergency source available.
    d. Primary/normal source available.

O. Interface with Other Work:
1. Interface with engine generators as specified in Section 26 32 13.
2.

2.03 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Perform production tests on transfer switches at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

2.04 AUTOMATIC TRANSFER SWITCH

A. Description: NEMA ICS 10, automatic transfer switch 400 amp,3 pole, in NEMA1 enclosure.

B. Configuration: Electrically operated, mechanically held transfer switch.

C. Interrupting Capacity: 42000 amp minimum ,rms .

2.05 SERVICE CONDITIONS

A. Service Conditions: NEMA ICS 10.

B. Temperature: 105 deg F.

C. Altitude: 3,300 feet.

2.06 COMPONENTS

A. Indicating Lights: Mount in cover of enclosure to indicate NORMAL SOURCE AVAILABLE.

B. Test Switch: Mount in cover of enclosure to simulate failure of normal source.

C. Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate source to normal source.

D. Transfer Switch Auxiliary Contacts: 1 normally open; 1 normally closed.

E. Normal Source Monitor: Monitor each line of normal source voltage and frequency; initiate transfer when voltage drops below 85 percent or frequency varies more than 3 percent from rated nominal value.

F. Alternate Source Monitor: Monitor alternate source voltage and frequency; inhibit transfer when voltage is below 85 percent or frequency varies more than 3 percent from rated nominal value.

G. In-Phase Monitor: Inhibit transfer until source and load are within zero electrical degrees.

H. Switched Neutral: Overlapping contacts.

I. Enclosure: ICS 10, Type 1, finished with manufacturer's standard gray enamel.

2.07 AUTOMATIC SEQUENCE OF OPERATION

A. Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor.

B. Time Delay To Start Alternate Source Engine Generator: 0 to 6 seconds, adjustable.

C. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.

D. Time Delay Before Transfer to Alternate Power Source: 0 to 60 seconds, adjustable.

E. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.

F. Time Delay Before Transfer to Normal Power: 0 to 60 seconds, adjustable; bypass time delay in event of alternate source failure.

G. Time Delay Before Engine Shut Down: 0 to 1 minutes, adjustable, of unloaded operation.

H. Engine Exerciser: Start engine every 15days run for 30 minutes before shutting down. Bypass exerciser control if normal source fails during exercising period.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that surface is suitable for transfer switch installation.

3.02 PREPARATION

A. Provide 4" housekeeping pads.

3.03 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1.

B. Install in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Install transfer switches plumb and level.

E. Unless otherwise indicated, mount floor-mounted transfer switches on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.

F. Provide grounding and bonding in accordance with Section 26 05 26.

G. Identify transfer switches in accordance with Section 26 05 53.

H. Provide engraved plastic nameplates under the provisions of Section 26 0553.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

C. Prepare and start system in accordance with manufacturer's instructions.

D. Automatic Transfer Switches:

1. Inspect and test in accordance with NETA ATS, except Section 4.
2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The control wiring insulation-resistance tests listed as optional are not required.
    a. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

E. Provide additional inspection and testing as required for completion of associated engine generator testing as specified in Section 26 32 13.

F. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

G. Submit detailed reports indicating inspection and testing results and corrective actions taken.

H. Provide the services of the manufacturer's technical representative to check out transfer switch connections and operation and place in service.

I. Perform field inspection and testing in accordance with Section [].

J. Inspect and test in accordance with NETA STD ATS, except Section 4.

K. Perform inspections and tests listed in NETA STD ATS, Section 7.22.3.

3.05 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of transfer switches to Owner, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, and maintenance of transfer switches.
    1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

E. Demonstrate operation of transfer switch in bypass, normal, and emergency modes.

3.07 PROTECTION

A. Protect installed transfer switches from subsequent construction operations.

3.08 MAINTENANCE

A. See Section 01 70 00 - Execution Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of transfer switches for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

C. Conduct site visit at least once every three months to perform inspection, testing, and preventive maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.

D. Provide trouble call-back service upon notification by Owner:
    1. Provide on-site response within 4 hours of notification.
    2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
    3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

E. Maintain an on-site log listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced.

F. Provide a separate maintenance contract for specified maintenance service.

G. Provide service and maintenance of transfer switches for 2 years from Date of Substantial Completion.

END OF SECTION

SECTION 26 43 00
SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surge protective devices for service entrance locations.

B. Surge protective devices for distribution locations.

1.02 ABBREVIATIONS AND ACRONYMS

A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.

B. SPD: Surge Protective Device.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

C. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to ordering equipment.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.
   1. SPDs with EMI/RFI filter: Include noise attenuation performance.

C. Shop Drawings: Include wiring diagrams showing all factory and field connections with wire and circuit breaker/fuse sizes.

D. Certificates: Manufacturer's documentation of listing for compliance with the following standards:
   1. UL 1449.
   2. UL 1283 (for Type 2 SPDs).

E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Operation and Maintenance Data: Include information on status indicators and recommended maintenance procedures and intervals.

G. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

H. Project Record Documents: Record actual connections and locations of surge protective devices.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Schneider Electric; Square D Brand Surgelogic Products as indicated under product article(s) below; www.surgelogic.com.

B. Surge Protective Devices (SPD) as manufactured by Siemens Industry, Inc. are a permitted substitution with the inclusion of a Surge Counter and an External Operable Disconnect.

C. Surge Protective Devices (SPD) as manufactured by Advanced Protection Technologies, Inc. are a permitted substitution with inclusion of an externally operable switch / breaker.

D. Factory-installed, Internally Mounted Surge Protective Devices:
   1. Same as manufacturer of equipment containing surge protective device, to provide a complete listed assembly including SPD.

E. Source Limitations: Furnish surge protective devices produced by a single manufacturer and obtained from a single supplier.

2.02 ALL SURGE PROTECTIVE DEVICES

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service, listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated; system voltage as indicated on the drawings.

B. Protected Modes:
   1. Wye Systems: L-N, L-G, N-G, L-L.

C. UL 1449 Voltage Protection Ratings (VPRs):
   1. Equivalent to basis of design.
   2. 480Y/277V System Voltage: Not more than 1,500 V for L-N, L-G, and N-G modes and 2,000 V for L-L mode.

D. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

E. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   1. Indoor clean, dry locations: Type 1.

F. Mounting for Field-installed, Externally Mounted SPDs: Unless otherwise indicated, as specified for the following locations:

G. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.
   1. Switchboards: See Section 26 24 13.

2.03 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

A. Unless otherwise indicated, provide field-installed, externally mounted or factory-installed, internally mounted SPDs.

B. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

C. Provide SPDs utilizing field-replaceable modular or non-modular protection circuits.

D. Surge Current Rating: Not less than 120 kA per mode/240 kA per phase.

E. Repetitive Surge Current Capacity: Not less than 5,000 impulses.

F. UL 1449 Nominal Discharge Current (I-n): 20 kA.

G. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.

H. Diagnostics:
   1. Protection Status Monitoring: Provide indicator lights to report the protection for each phase.
   2. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

I. Basis of Design: Schneider Electric; Square D Brand Surgelogic Products; www.surgelogic.com.
   1. Field-installed, Externally Mounted Surge Protective Devices:
      a. EMA Series: Replaceable modules; 200 kA SCCR; individually fused MOVs, thermal fusing; dry contacts; EMI/RFI filtering; surge counter; duty cycle tested for 20,000 impulses; 10 year warranty.
   2. Factory-installed, Internally Mounted Surge Protective Devices:
      a. IMA Series: Replaceable modules; 200 kA SCCR; individually fused MOVs, thermal fusing; dry contacts; EMI/RFI filtering; surge counter; duty cycle tested for 20,000 impulses; 10 year warranty.

2.04 SURGE PROTECTIVE DEVICES FOR DISTRIBUTION LOCATIONS

A. Unless otherwise indicated, provide field-installed, externally mounted or factory-installed, internally mounted SPDs.

B. List and label as complying with UL 1449, Type 1 or Type 2.

C. Provide SPDs utilizing field-replaceable modular or non-modular protection circuits.

D. Surge Current Rating: Not less than 80 kA per mode/160 kA per phase.

E. UL 1449 Nominal Discharge Current (I-n): 20 kA.

F. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.

G. Diagnostics:
   1. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.
   2. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

H. Provide surge rated integral disconnect switch for SPDs not connected to a dedicated circuit breaker or fused switch or not direct bus connected.

I. Basis of Design: Schneider Electric; Square D Brand Surgelogic Products; www.surgelogic.com.

1. Field-installed, Externally Mounted Surge Protective Devices:
   a. EMA Series: Replaceable modules; 200 kA SCCR; individually fused MOVs, thermal fusing; dry contacts; EMI/RFI filtering; surge counter; duty cycle tested for 20,000 impulses; 10 year warranty.
      1) Furnished with integral switch option where indicated.
2. Factory-installed, Internally Mounted Surge Protective Devices:
   a. IMA Series: Replaceable modules; 200 kA SCCR; individually fused MOVs, thermal fusing; dry contacts; EMI/RFI filtering; surge counter; duty cycle tested for 20,000 impulses; 10 year warranty.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.

C. Verify that electrical equipment is ready to accept connection of the SPD and that installed overcurrent device is consistent with requirements of drawings and manufacturer's instructions.

D. Verify system grounding and bonding is in accordance with Section 26 05 26, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1.

B. Install SPD in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide conductors with minimum ampacity as required by NFPA 70 and not less than manufacturer's recommended minimum conductor size.

E. Install conductors between SPD and equipment terminations as short and straight as possible, not exceeding manufacturer's recommended maximum conductor length. Breaker locations may be reasonably be rearranged in order to provide leads as short and straight as possible. Twist conductors together to reduce inductance.

F. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26 05 26 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

3.03 FIELD QUALITY CONTROL

A. Perform inspection, testing, and adjusting in accordance with Section 01 40 00.

B. Inspect and test in accordance with NETA STD ATS, except Section 4.

C. Perform inspections and tests listed in NETA STD ATS Section 7.19.1.

D. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.

3.04 CLEANING

A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 51 00
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts.

E. Lamps.

F. Luminaire accessories.

1.02 RELATED REQUIREMENTS

A. Section 26 05 37 - Boxes.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

C. Section 26 09 23 - Lighting Control Devices: Automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.

D. Section 26 27 26 - Wiring Devices: Manual wall switches and wall dimmers.

E. Section 26 56 00 - Exterior Lighting.

1.03 REFERENCE STANDARDS

A. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns; 2006.

B. ANSI C82.1 - American National Standard for Lamp Ballast - Line Frequency Fluorescent Lamp Ballast; 2004.

C. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type); 2002.

D. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; 2011.

E. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).

F. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; Illuminating Engineering Society; 2008.

G. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.

H. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

I. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.

J. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

K. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association; 2002.

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. NFPA 101 - Life Safety Code; 2015.

N. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

O. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.

P. UL 1598 - Luminaires; Current Edition, Including All Revisions.

Q. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
   2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
   3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
   4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
   2. Provide photometric calculations where luminaires are proposed for substitution upon request.

C. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

D. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
      b. Include IES LM-79 test report upon request.

E. Sustainable Design Documentation: Submit manufacturer's product data on lamp mercury content and rated lamp life, showing compliance with specified requirements.

F. Field Quality Control Reports.

G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

H. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.
   3. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.
   4. Extra Ballasts: Two percent of total quantity installed for each type, but not less than one of each type.

J. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Conform to requirements of NFPA 70 and NFPA 101.

D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide two year manufacturer warranty for all linear fluorescent ballasts.

1.10 EXTRA MATERIALS

A. See Section 01 6000 - Product Requirements, for additional provisions.

B. Furnish two of each plastic lens type.

C. Furnish one replacement lamps for each lamp type.

D. Furnish two of each ballast type.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acuity Brands, Inc; : www.acuitybrands.com.

B. Hubbell Lighting, Inc; : www.hubbelllighting.com.

C. Lightolier: www.lightolier.com.

D. Lithonia Lighting: www.lithonia.com.

E. Columbia Lighting.

F. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LUMINAIRES

A. Manufacturers:
   1. Acuity Brands, Inc; : www.acuitybrands.com/#sle.
   2. Cooper Lighting, a division of Cooper Industries; : www.cooperindustries.com/#sle.
   3. Hubbell Lighting, Inc; : www.hubbelllighting.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Provide products that comply with requirements of NFPA 70.

C. Provide products that are listed and labeled as complying with UL 1598, where applicable.

D. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

H. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 200,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

I. LED Luminaires: Listed and labeled as complying with UL 8750.

J. Track Lighting Systems: Provide track compatible with specified track heads, with all connectors, power feed fittings, dead ends, hangers and canopies as necessary to complete installation.

K. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.03 EMERGENCY LIGHTING UNITS

A. Manufacturers:
   1. Acuity Brands, Inc; : www.acuitybrands.com/#sle.
   2. Cooper Lighting, a division of Cooper Industries; : www.cooperindustries.com/#sle.
   3. Hubbell Lighting, Inc; : www.hubbelllighting.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924. Emergency and Exit light combination unit with (2) unit mounted lamps and LED exit light with battery backup. Thois combination unit shall have spare capacity to power remote emergency lamp heads.

C. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

D. Battery:
   1. Sealed maintenance-free nickel cadmium unless otherwise indicated.
   2.
   3. Size battery to supply all connected lamps, including emergency remote heads where indicated.

E. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

F. Provide low-voltage disconnect to prevent battery damage from deep discharge.

G. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

H. Accessories:
   1. Provide compatible accessory mounting brackets where indicated or required to complete installation.
   2. Provide compatible accessory high impact polycarbonate vandal shields where indicated.
   3. Provide compatible accessory wire guards where indicated.
   4. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

2.04 LUMINAIRES

A. Furnish products as indicated in Schedule attached to this section.

B. Substitutions: See Section 01 60 00 - Product Requirements.
   1. Input Voltage: 120 or 277 volts.

2.05 EXIT SIGNS

A. Manufacturers:
   1. Acuity Brands, Inc; : www.acuitybrands.com/#sle.
   2. Cooper Lighting, a division of Cooper Industries; : www.cooperindustries.com/#sle.
   3. Hubbell Lighting, Inc; : www.hubbelllighting.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. All Exit Signs: Internally illuminated with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single or double as indicated or as required for the installed location.
   2. Directional Arrows: As indicated or as required for the installed location.

C. Self-Powered Exit Signs:
   1. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
   2. Battery: Sealed maintenance-free nickel cadmium unless otherwise indicated.
   3. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
   4. Provide low-voltage disconnect to prevent battery damage from deep discharge.
   5. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

D. Accessories:
   1. Provide compatible accessory high impact polycarbonate vandal shields where indicated.
   2. Provide compatible accessory wire guards where indicated.

E. Manufacturers: As indicated on lighting fixture schedule.
   1. Substitutions: See Section 01 60 00 - Product Requirements.

F. Exit Signs: Exit sign fixture .
   1. Housing: Plastic.
   2. Face: Translucent glass face with red letters on white background.
   3. Face: Aluminum stencil face with red letters.
   4. Directional Arrows: Universal type for field adjustment.
   5. Mounting: Universal, for field selection.
   6. Battery: 12 volt, nickel-cadmium type, with 1.5 hour capacity.
   7. Battery Charger: Dual-rate type, with sufficient capacity to recharge discharged battery to full charge within twelve hours.
   8. Lamps: Manufacturer's standard.
   9. Input Voltage: 120/277 volts.

2.06 BALLASTS

A. Manufacturers:
   1. General Electric Company/GE Lighting; : www.gelighting.com/#sle.
   2. Osram Sylvania; : www.sylvania.com/#sle.
   3. Philips Lighting Electronics/Advance; : www.advance.philips.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.
   5. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.

B. All Ballasts:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).

2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

C. Fluorescent Ballasts:
1. All Fluorescent Ballasts: Unless otherwise indicated, provide high frequency electronic ballasts complying with ANSI C82.11 and listed and labeled as complying with UL 935.
a. Input Voltage: Suitable for operation at voltage of connected source, with variation tolerance of plus or minus 10 percent.
b. Total Harmonic Distortion: Not greater than 10 percent.
c. Power Factor: Not less than 0.95.
d. Thermal Protection: Listed and labeled as UL Class P, with automatic reset for integral thermal protectors.
e. Sound Rating: Class A, suitable for average ambient noise level of 20 to 24 decibels.
f. Lamp Compatibility: Specifically designed for use with the specified lamp, with no visible flicker.
g. Lamp Operating Frequency: Greater than 20 kHz, except as specified below.
1) Do not operate lamp(s) within the frequencies from 30 kHz through 40 kHz in order to avoid interference with infrared devices.
h. Lamp Current Crest Factor: Not greater than 1.7.
i. Provide automatic restart capability to restart replaced lamp(s) without requiring resetting of power.
j. Provide end of lamp life automatic shut down circuitry for T5 and smaller diameter lamp ballasts.
k. Surge Tolerance: Capable of withstanding characteristic surges according to IEEE C62.41.2, location category A.
l. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 18, for Class A, non-consumer application.
m. Provide high efficiency T8 lamp ballasts certified as NEMA premium where indicated.
n. Ballast Marking: Include wiring diagrams with lamp connections.
2. Non-Dimming Fluorescent Ballasts:
a. Lamp Starting Method:
1) T8 Lamp Ballasts: Programmed start unless otherwise indicated.
2) T5 Lamp Ballasts: Programmed start unless otherwise indicated.
3) Compact Fluorescent Lamp Ballasts: Programmed start unless otherwise indicated.
b. Lamp Starting Temperature: Capable of starting standard lamp(s) at a minimum of 0 degrees F, and energy saving lamp(s) at a minimum of 60 degrees F unless otherwise indicated.

2.07 LAMPS

A. Manufacturers:
1. General Electric Company/GE Lighting; : www.gelighting.com/#sle.
2. Osram Sylvania; : www.sylvania.com/#sle.
3. Philips Lighting Company; : www.lighting.philips.com.
4. Philips Lighting Co of NA: www.lighting.philips.com.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. All Lamps:
1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.

4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

C. Compact Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
   1. Low Mercury Content: Provide lamps that pass the EPA Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic hazardous waste.
   2. Correlated Color Temperature (CCT): 3,500 K unless otherwise indicated.
   3. Color Rendering Index (CRI): Not less than 80.
   4. Average Rated Life: Not less than 10,000 hours for an operating cycle of three hours per start.

D. Linear Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
   1. Low Mercury Content: Provide lamps that pass the EPA Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic hazardous waste.
   2. T8 Linear Fluorescent Lamps:
      a. Correlated Color Temperature (CCT): 3,500 K unless otherwise indicated.
      b. Color Rendering Index (CRI): Not less than 80.
      c. Average Rated Life: Not less than 20,000 hours for an operating cycle of three hours per start.
   3. T5 Linear Fluorescent Lamps:
      a. Correlated Color Temperature (CCT): 3,500 K unless otherwise indicated.
      b. Color Rendering Index (CRI): Not less than 80.
      c. Average Rated Life: Not less than 20,000 hours for an operating cycle of three hours per start.

E. Lamp Types: As specified for each luminaire.

F. Fluorescent Lamps:
   1. Product: Phillips Lighting - Type T5 or T8.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

G. High Intensity Discharge (HID) Lamps:
   1. Product: Match Lighting Fixture Type
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.08 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

D. Tube Guards for Linear Fluorescent Lamps: Provide clear virgin polycarbonate sleeves with endcaps where indicated.

E. Product: As indicated in lighting fixture schedule.
   1. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of luminaires provided under this section.

B. Install products according to manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship), NECA 500 (commercial lighting), and NECA 502 (industrial lighting).

D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

E. Suspended Ceiling Mounted Luminaires:
   1. Do not use ceiling tiles to bear weight of luminaires.
   2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
   3. Secure pendant-mounted luminaires to building structure.
   4. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
   5. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gage, connected from opposing corners of each recessed luminaire to building structure.
   6. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

F. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.
   2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
   3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

G. Suspended Luminaires:
   1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
   2. Install canopies tight to mounting surface.

H. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

I. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).

J. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

K. Support luminaires independent of ceiling framing.

L. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.

M. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

N. Exposed Grid Ceilings: Support surface mounted luminaires in grid ceiling directly from building structure.

O. Exposed Grid Ceilings: Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires.

P. Exposed Grid Ceilings: Fasten surface mounted luminaires to ceiling grid members using bolts, screws, rivets, or suitable clips.

Q. Install recessed luminaires to permit removal from below.

R. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

S. Install clips to secure recessed grid-supported luminaires in place.

T. Install wall mounted luminaires, emergency lighting units, and exit signs at height as scheduled.

U. Install accessories furnished with each luminaire.

V. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

W. Bond products and metal accessories to branch circuit equipment grounding conductor.

X. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.

Y. Air Handling Luminaires: Interface with air handling accessories furnished and installed under Section 23 36 00.

Z. Emergency Lighting Units:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

AA. Exit Signs:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

AB. Install lamps in each luminaire.

AC. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Perform field inspection, testing, and adjusting in accordance with Section 01 4000.

D. Operate each luminaire after installation and connection to verify proper operation.

E. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

F. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

D. Aim and adjust luminaires as indicated.

E. Position exit sign directional arrows as indicated.

3.06 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosures.

D. Clean photometric control surfaces as recommended by manufacturer.

E. Clean finishes and touch up damage.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

3.09 PROTECTION

A. Relamp luminaires that have failed lamps at Substantial Completion.

3.10 SCHEDULE - ATTACHED

END OF SECTION

SECTION 26 56 00
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

B. Ballasts.

C. Lamps.

D. Poles and accessories.

E. Luminaire accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 37 - Boxes.

D. Section 26 27 26 - Wiring Devices: Receptacles for installation in poles.

E. Section 26 28 13 - Fuses.

F. Section 26 51 00 - Interior Lighting.

1.03 REFERENCE STANDARDS

A. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals; 2013, with Editorial Revision (2022).

B. ANSI O5.1 - American National Standard for Wood Poles: Specifications and Dimensions; 2022.

C. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).

D. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.

E. IESNA LM-64 - Photometric Measurements of Parking Areas; 2001 (Reaffirmed 2007).

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

G. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 1598 - Luminaires; Current Edition, Including All Revisions.

J. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
2. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
2. Provide photometric calculations where luminaires are proposed for substitution .

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
   2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IESNA LM-63 standard format upon request.
   3. Lamps: Include rated life and initial and mean lumen output.
   4. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

D. Sustainable Design Documentation: Submit manufacturer's product data on lamp mercury content and rated lamp life, showing compliance with specified requirements.

E. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

G. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

I. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

C. Receive, handle, and store wood poles in accordance with ANSI O5.1.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acuity Brands, Inc; : www.acuitybrands.com.

B. Hubbell Lighting, Inc; : www.hubbelllighting.com.

C. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the Drawings.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 LUMINAIRES

A. Manufacturers:
   1. Acuity Brands, Inc; : www.acuitybrands.com/#sle.
   2. Hubbell Lighting, Inc; : www.hubbelllighting.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Provide products that comply with requirements of NFPA 70.

C. Provide products that are listed and labeled as complying with UL 1598, where applicable.

D. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

H. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

I. LED Luminaires: Listed and labeled as complying with UL 8750.

J. Exposed Hardware: Stainless steel.

2.04 BALLASTS

A. Manufacturers:
   1. General Electric Company/GE Lighting; : www.gelighting.com/#sle.
   2. Osram Sylvania; : www.sylvania.com/#sle.
   3. Philips Lighting Electronics/Advance; : www.advance.philips.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. All Ballasts:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

2.05 LAMPS

A. Manufacturers:
   1. General Electric Company/GE Lighting; : www.gelighting.com/#sle.
   2. Osram Sylvania; : www.sylvania.com/#sle.
   3. Philips Lighting Company; : www.lighting.philips.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. All Lamps:
   1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.

2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

2.06 POLES

A. Manufacturers:
   1. Acuity Brands, Inc; : www.acuitybrands.com/#sle.
   2. Hubbell Lighting, Inc; : www.hubbelllighting.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. All Poles:
   1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
   2. Structural Design Criteria:
      a. Comply with AASHTO LTS.
      b. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.
         1) Design Wind Speed: 100 miles per hour, with gust factor of 1.3.
      c. Dead Load: Include weight of proposed luminaire(s) and associated supports and accessories.
   3. Material: Steel, unless otherwise indicated.
   4. Shape: Square straight, unless otherwise indicated.
   5. Finish: Match luminaire finish, unless otherwise indicated.
   6. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
   7. Unless otherwise indicated, provide with the following features/accessories:
      a. Top cap and metallic base cover.
      b. Handhole.
      c. Anchor bolts with leveling nuts or leveling shims.
      d. Anchor base cover.
      e. Pole-top tenon, size as required for installed luminaire or bracket.

C. Metal Poles: Provide ground lug, accessible from handhole or transformer base.

2.07 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of luminaires provided under this section.

B. Install products according to manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship) and NECA/IESNA 501 (exterior lighting).

D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

E. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.
   2. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

G. Install accessories furnished with each luminaire.

H. Bond products and metal accessories to branch circuit equipment grounding conductor.

I. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.06 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

D. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

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SECTION 27 10 05

STRUCTURED CABLING FOR VOICE AND DATA - INSIDE-PLANT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Communications system design requirements.

B. Communications pathways.

C. Copper cable and terminations.

D. Fiber optic cable and interconnecting devices.

E. Communications equipment room fittings.

F. Communications outlets.

G. Communications grounding and bonding.

H. Communications identification.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 26 05 37 - Boxes.

1.03 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; 2005e.

C. ICEA S-83-596 - Indoor Optical Fiber Cable; 2021.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; 1988a (Reaffirmed 2012).

F. TIA-492AAAD - Detail Specification for 850-nm Laser- Optimized, 50-?m Core Diameter/125-?m Cladding Diameter Class la Graded-Index Multimode Optical Fibers Suitable for Manufacturing OM4 Cabled Optical Fiber; 2009.

G. TIA-526-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant, Adoption of IEC 61280-4-2 Edition 2: Fibre-Optic Communications Subsystem Test Procedures – Part 4-2: Installed Cable Plant – Single-Mode Attenuation and Optical Return Loss Measurement; 2015a (Reaffirmed 2022).

H. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2020.

I. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2018d, with Addenda (2020).

J. TIA-569 - Telecommunications Pathways and Spaces; 2019e.

K. TIA-568-C.3 - Optical Fiber Cabling Components Standard; Rev C, 2008 (with Addenda; 2011).

L. TIA-598-D - Optical Fiber Cable Color Coding; Rev D, 2014.

M. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.

N. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2019d.

O. TIA-607-C - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; Rev C, 2015.

P. UL 444 - Communications Cables; Current Edition, Including All Revisions.

Q. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

R. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.

S. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
   3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Notify Architect/Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
   5. Coordinate requirements of this section with Owner.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

D. Evidence of qualifications for installer.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

F. Field Test Reports.

G. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
   1. Record actual locations of outlet boxes and distribution frames.
   2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
   3. Identify distribution frames and equipment rooms by room number on contract drawings.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.

B. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
   1. Supervisors and installers factory certified by manufacturers of products to be installed.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean and dry.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 2 year period after Date of Substantial Completion.

C. Provide warranty as called out in applicable referenced State of Delaware standards/specifications

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cabling and Equipment:

2.02 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.

B. NOTE: Unless otherwise indicated all cables provided or supplied shall be plenum rated

C. **IMPORTANT!! PLEASE NOTE THAT this specification references the Delaware State-Wide Information And Architecture Standards, Standard ID: NE=Cabling-002, Title: Structured Cabling System Standards and Specifications for State-Managed Facilities, Domain: Network and Storage, Discipline: Cabling, Revision Date: 1/29/2021, Revision no.: 8, Original date: 7/21/2008. As such this document shall be considered as part of this specification. Unless otherwise shown and or specified, all work, materials, etc. called for in the above mentioned document shall be provided as shown and specified the above mentioned document and on the drawings.**
   1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
   2. Comply with Communications Service Provider requirements.
   3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
   4. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.

D. System Description:
   1. Building Entrance Cable: By others.
   2. Backbones - Within Building: Fiber optic, 12-fiber.
   3. Offices and Work Areas: Provide as indicated on drawings in each work area.
   4. Classrooms: Provide as indicated on drawings.
   5. Other areas and devices, etc.: Provide as indicated on drawings.

E. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets and backbone cables that extend to intermediate distribution frames (IDFs), functioning as point of presence to external service provider.
   1. Locate main distribution frame as indicated on the drawings.
   2. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.

F. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.
   1. Locate intermediate distribution frames as indicated on the drawings.

G. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.

H. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.03 PATHWAYS

A. Refer to above mentioned Delaware State-Wide Information And Architecture Standards as well as other project specifications and drawings.

B. Underground Service Entrance: Rigid polyvinyl chloride (PVC) conduit, Schedule 40.

C. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
   1. Products:

a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle. or approved equal

2.04 COPPER CABLE AND TERMINATIONS

A. Manufacturers:
1. Hubbell; https://www.hubbell.com/hubbellpremisewiring/en.
2. Berk-Tek: https://www.leviton.com/en/products/commercial/network-solutions/cable/berktek
3. Panduit: https://www.panduit.com/
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Copper Horizontal Cable:
1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
2. Cable Type - Voice and Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
3. Cable Capacity: 4-pair.
4. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.
5. Cable Jacket Color -Data and other applicable types of Cable: Refer to drawings.
6. Product(s):
   a. Hubbell M/N HC6RPX or approved equal.

C. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

D. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
1. Performance: 500 mating cycles.
2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.
3. Product(s):
   a. Hubbell M/N HJU6X or approved equal.

E. Copper Patch Cords:
1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.
2. Patch Cords for Patch Panels:
   a. Quantity: One for each pair of patch panel ports.
   b. Length: 12 inches.
3. Product(s):
   a. Hubbell M/N NSC6X01 or approved equal.. This is for a 12 inch/one foot patch cable. Provide applicable length and color patch cables as indicated for applications other than patch panel connections.

2.05 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

A. Fiber Optic Backbone Cable:
1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568-C.3, TIA-598-D, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
2. Cable Type: Multimode, laser-optimized 50/125 um (OM4) complying with TIA-492AAAD.
3. Cable Capacity: 12-fiber.
4. Cable Applications:
   a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.
5. Cable Jacket Color:
   a. Laser-Optimized Multimode Fiber (OM3/OM4): Aqua.
6. Product(s):

a. Hubbell M/N HFCD15012P4 or approved equal. Indoor Interlock Armored Tyght Buffer Fiber Cable 50 um OM4 Multimode FIber Optic Cable

B. Fiber Optic Interconnecting Devices:
1. Connector Type: Type LC.
2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
3. Maximum Attenuation/Insertion Loss: 0.3 dB.
4. Product(s):
a. Hubbell M/N FSPLCDS6Y or approved equal. Provide 1 of these per 2U fiber patch panel box in each IDF. Provide 1 of these for each IDF in the MDF fiber optic patch panel enclosure
b. Provide 5 blanks per 2U fiber patch panel box in each IDF. Provide applicable amount to cover all open portions of fiber patch panels in each MDF. Provide Hubbell M/N FSPB or approved equal for these.

2.06 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Refer to above mentioned Delaware State-Wide Information And Architecture Standards as well as other project specifications and drawings.

B. Fiber Optic Cross-Connection Equipment:
1. Manufacturers:
a. Hubbell; https://www.hubbell.com/hubbellpremisewiring/en
b. Legrand; https://www.legrand.us/.
c. Pantuit; https://www.panduit.com/.
d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch wide equipment racks; 0.09 inch thick aluminum.
a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; maximum of 24 duplex adaptors per standard panel width.
b. Provide incoming cable strain relief and routing guides on back of panel.
c. Provide rear cable management tray at least 8 inches deep with removable cover.
d. Provide dust covers for unused adapters.
3. Product(s):
a. HUBBELL M/N FCR2U6SP or approved equal.

C. Backboards: Interior grade plywood without voids, 3/4 inch thick; UL-labeled fire-retardant.
1. Do not paint over UL label.
2. Cover entire back wall of each MDF or IDF, behind racks indicated, with the plywood unless otherwise indicated.

D. Equipment Frames, Racks and Cabinets:
1. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug. Provide Hubbell M/N HHR45U10 or approved equal.
a. Load Rating: 2500 pounds.

E. Cable Management:
1. Product(s):
a. Ladder Rack/Tray: Hubbell Nextframe or approved equal

2.07 COMMUNICATIONS OUTLETS

A. Refer to above mentioned Delaware State-Wide Information And Architecture Standards as well as other project specifications and drawings.

B. Outlet Boxes: Comply with Section 26 05 37.
1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
2. Minimum Size, Unless Otherwise Indicated:

a. Voice Only Outlets: 4 inch by 2 inch by 2-1/8 inch deep (100 by 50 by 54 mm) trade size.
b. Data or Combination Voice/Data Outlets: 4 inch by 2 inch by 2-1/8 inch deep (100 by 50 by 54 mm) trade size..

C. Wall Plates:
1. Comply with system design standards and UL 514C.
2. Accepts modular jacks/inserts.
3. Capacity:
4. Wall Plate Material/Finish - Flush-Mounted Outlets: Type 302 stainless steel.

2.08 GROUNDING AND BONDING COMPONENTS

A. Refer to above mentioned Delaware State-Wide Information And Architecture Standards as well as other project specifications and drawings.

B. Comply with TIA-607-C.

2.09 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.

B. Identification shall be as specified and directed by Owner at no additional cost to the Owner

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Comply with Communication Service Provider requirements.

C. Grounding and Bonding: Perform in accordance with TIA-607-C and NFPA 70.

D. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

E. Refer to above mentioned Delaware State-Wide Information And Architecture Standards as well as other project specifications and drawings.

3.02 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:
1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
2. 12 inches from power conduits and cables and panelboards.
3. 5 inches from fluorescent and high frequency lighting fixtures.
4. 6 inches from flues, hot water pipes, and steam pipes.

B. Minimum Cover - Underground Service Entrance: Comply with NFPA 70 and Communications Service Provider requirements.

C. Outlet Boxes:
1. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of telecommunications outlets provided under this section.
a. Mounting Heights: Unless otherwise indicated, as follows:
1) Telephone and Data Outlets: 18 inches above finished floor.
2) Telephone Outlets for Side-Reach Wall-Mounted Telephones: 48 inches above finished floor to top of telephone.
3) Telephone Outlets for Forward-Reach Wall-Mounted Telephones: 48 inches above finished floor to top of telephone.
b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.

c. Provide minimum of six inches horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
d. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
e. Locate outlet boxes so that wall plate does not span different building finishes.
f. Locate outlet boxes so that wall plate does not cross masonry joints.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:
1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
2. Do not over-cinch or crush cables.
3. Do not exceed manufacturer's recommended cable pull tension.
4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Copper Cabling:
1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch from point of termination.
2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.
3. Use T568B wiring configuration.

C. Fiber Optic Cabling:
1. Prepare for pulling by cutting outer jacket for 10 inches from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
2. Support vertical cable at intervals as recommended by manufacturer.

D. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.

E. Floor-Mounted Enclosures: Connect adjacent cabinets together and remove interior side panels.

F. Identification:
1. Use wire and cable markers to identify cables at each end.
2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.
4. Identify components as directed by Owner at no additional cost to Owner.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:
1. Inspect cable jackets for certification markings.
2. Inspect cable terminations for color coded labels of proper type.
3. Inspect outlet plates and patch panels for complete labels.

D. Testing - Copper Cabling and Associated Equipment:
1. Test backbone cables after termination but before cross-connection.
2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.
3. Test operation of shorting bars in connection blocks.
4. Category 3 Backbone: Perform attenuation test.
5. Category 3 Links: Test each pair for short circuit continuity, short to ground, crosses, reversed polarity, operational and ring-back, and dial tone.

6. Category 5e and Above Backbone: Perform near end cross talk (NEXT) and attenuation tests.
7. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.
8. Refer to above mentioned Delaware State-Wide Information And Architecture Standards as well as other project specifications and drawings.

E. Testing - Fiber Optic Cabling:
1. Backbone: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.
2. Single Mode Backbone: Perform tests in accordance with TIA-526-7.
3. Links: Perform optical fiber end-to-end attenuation tests and field reel tests.
4. Refer to above mentioned Delaware State-Wide Information And Architecture Standards as well as other project specifications and drawings.

F. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

SECTION 27 51 17
PUBLIC ADDRESS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Amplifier and control equipment.

B. Input equipment.

C. Sound system cable.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 37 - Boxes.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SYSTEM DESCRIPTION

A. Public address system for voice and music.

B. Input components:
   1. Compact disc player.
   2. AM/FM tuner.
   3. Microphone.

C. Features:
   1. Interface to telephone system.
   2. One-way paging by zone.
   3. Distribution of background music.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate electrical characteristics and connection requirements. Indicate layout of equipment mounted in racks and cabinets, component interconnecting wiring, and wiring diagrams of field wiring to speakers and remote input devices.

C. Product Data: Provide data showing electrical characteristics and connection requirements for each component.

D. Test Reports: Indicate satisfactory completion of each test recommended by the manufacturer.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Numbered Certificate of Completion for installation, programming, and service training, which identifies the installing technician(s) as having successfully completed the Nyquist E7000 technical training course provided by the Bogen Communications LLC.

H. Manufacturer's Field Reports: Indicate that installation is complete and system performs according to specified requirements.

I. Project Record Documents: Record actual locations of speakers, control equipment, and outlets for input/output connectors.

J. Operation Data: Include instructions for adjusting, operating, and extending the system.

K. Maintenance Data: Include repair procedures and spare parts documentation.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 and Federal Communications Commission.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience with service facilities within 100 miles of Project.

C. Supplier Qualifications: Authorized distributor of specified manufacturer with minimum three years documented experience.

D. Installer Qualifications: Authorized installer of specified manufacturer with service facilities within 50 miles of Project.

E. Products: Listed, classified, and labeled as suitable for the purpose intended.

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 WARRANTY

A. Provide 2 year warranty for entire system to include parts and labor starting from date of project substantial completion.

B. Provide 5 year manufacturer warranty for hardware with the exception of the Bogen NQ-SYSCTRL, NQ-T1100 and NQ-T1000 which each carry a two (2) year warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bogen Communications, Inc: www.bogen.com.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 AMPLIFICATION AND CONTROL EQUIPMENT

A. The basis of design is for a Bogen E7000 series Public Address (PA) system or approved equal. The contractor shall be responsible for providing a complete functional system, including all necessary components whether included in this specification or not. Capabilities of the system shall include, but not be limited to, the following
   1. Software-based, state-of-the-art, Voice over IP (VoIP) paging and intercom solution.
   2. The system shall provide a Web User Interface (Web UI) that shall allow users to configure and control the system, in accordance with their assigned User Role, from any Chrome or MS Edge Web browser enabled PC, Mac, or Android tablet or mobile device.
   3. The system shall support any combination of the following VoIP phone station types: NQ-T1100 Administrative VoIP Phone – Color Touch Display (Admin Station) or NQ-T1000 Staff VoIP Phone – LCD Display (Staff Station).
      a. All VoIP phone station types shall utilize the same type of field wiring.
      b. There shall be no limit to the number of Admin Stations that can be connected to a facility. Systems that require different head-end equipment to make Admin Stations function, or systems that limit the number of Admin or Staff Stations shall not be deemed acceptable.
   4. Future station alterations shall only require the Station Type to be changed in system programming. Alterations shall not require field wiring or system head-end alterations, unless an analog station device is being replaced by a VoIP station device or vice-versa.
   5. There shall be a Facility Wide Emergency All-Call feature. The Emergency All-Call shall be accessed from designated Admin Stations or the Nyquist Dashboard or by the activation of an external contact closure that shall give a microphone input Emergency status. The Emergency All-Call function shall have the highest system priority and shall override all other loudspeaker-related functions including Time Tones, Normal All-Call or Zone Pages, or Audio Distribution.
      a. Considering that Emergency calls are to be treated with the highest level of concern, systems that do not regard Emergency All-Call with the highest priority shall not be deemed as equal.
      b. Upon touching the Directory icon, a menu shall appear on the Admin Station display prompting the user to select the desired menu.

c. cThe Emergency All-Call shall capture the highest-level system priority and shall be transmitted over all speakers in the facility. It shall also be capable of activating an external control output, which can be used to activate external relays to automatically override volume controls, local sound systems, or strobe circuits.
d. This Emergency All-Call feature can have a four-digit pin number associated with it that would be required to use the feature or override someone that is already using this feature.
e. Systems without Emergency All-Call or systems with All-Call that cannot be activated by external means or that do not capture complete system priority or activate an external relay, shall not be acceptable.

6. There shall be unlimited Alarm Tones (four by default). Each may be accessed by dialing *91 and the two-digit tone number from any Admin Station, SIP Trunk, or FXO/FXS system interface. These Alarm Tones are separate from the Time Tones. Users shall be able to add an unlimited number of Alarm Tones to the system by uploading MP3 or WAV files. Systems that do not allow the user to upload MP3 and WAV files to customize the Alarm Tones or need to use external alarm/tone generators or special software or have less than four Emergency Alarm Tones shall not be acceptable.
7. Upon touching the Directory icon on an Admin Station, a menu shall appear on the display prompting the user to select from the sub-menus. The Alarms sub-menu is the first available. This precludes the user from having to memorize complicated key sequences to access Alarm Tones.
8. There shall be unlimited I/O Controller relay driver outputs accessible and controllable by properly authorized users via an Administrative Web UI. These outputs remain set until accessed and reset. Users shall have the ability to review the status of each relay driver output. Users shall be prompted through fields via a plain English menu, precluding users from having to remember any dialing sequences to control this feature. The system shall support an unlimited number of I/O Controllers, and each I/O Controller shall be able to interact with any and all other I/O Controllers on the system (i.e., an input on one I/O Controller can trigger an output on one or more different I/O Controllers). Systems that require the user to remember complicated dialing schemes or prompt the user via cryptic commands shall not be acceptable.
9. The I/O Controller can create a contact closure when the following operations are performed in the system:
    a. 911 call placed
    b. Audio Distributed
    c. Alarm is played
    d. Announcement is played
    e. All-Call preformed
    f. Multi-Site All-Call performed
    g. Multi-Site Emergency-All-Call
    h. Emergency-Call
    i. Emergency-All-Call
    j. Audio-Disabled
    k. Page
10. The system shall provide software controlled and programmable control outputs for external relay activation for use with strobe lights, magnetic locks, card access systems, motion detectors, cameras, or any low-voltage, dry contact creating device. Systems using dedicated security stations for control of external functions shall not be acceptable.
11. The system shall be capable of interfacing to PSTN/PBX/iPBX via both FXO/FXS line and SIP trunk connectivity.
12. The system shall be capable of supporting DID, DISA, and Security DISA functions.
    a. The system shall provide a password-protected Security DISA feature that shall only be accessible from authorized Police, Fire, Emergency personnel, or an off-premise security office that monitors the facility’s security system. The Security DISA feature shall function as follows: Upon dialing the Security DISA phone number, the caller will

receive a dial tone from the system, after which he or she must enter the assigned Security DISA passcode on the dial pad. Upon confirmation, the system will present the dial tone again and will allow the authorized personnel to dial any station/classroom on the system and monitor the activity without any pre-announce tone or privacy beep. This will allow the authorized personnel to audibly assess the situation and determine what actions need to be taken.

b. All DISA and Security DISA calls shall be automatically recorded by the system for later playback review and/or retrieval by authorized personnel and/or authorities.

13. The system shall provide for field-programmable three-, four-, five-, or six-digit architectural station numbers.
14. Each station loudspeaker shall be assignable to all or any combination of Paging, Time, and/or Audio Zones. Systems that do not provide unlimited Paging, Time, and/or Audio Zones shall not be acceptable.
15. There shall be unlimited schedules with unlimited programmable events per facility. Each event shall sound one user-selected tone or external audio source. It shall be possible to assign each schedule to a day of the week or to manually change schedules from an authorized user via a web-based UI. Systems that do not provide unlimited schedules, events, and tones, or that require software to be installed on a PC to perform these functions shall not be acceptable.
    a. The system shall provide multiple concurrent schedules per facility/location to accommodate split facilities (for example., combined Elementary and Middle School, combined Middle and High School, etc.).
    b. The system must be capable of providing Class Change Music to be played from an external audio source or audio files that are stored in playlists on the system during class change periods or whenever a facility wants music to be played in an area (i.e., (i.e., one or more Time Zones) on an automated schedule.
    c. Each event shall be able to be directed to any one or more of the unlimited Time Zones.
    d. Each of the unlimited Time Zones shall have a programmable, customizable Pre-announce Tone and volume control that is unique unto itself.
    e. Each event shall play any of the Normal tones or external audio. Each event may utilize a different tone. For example, the system shall be capable of sending the gymnasium, shop classes, and pool a separate, unique time tone to indicate “clean up.” Minutes later, the entire facility can be sent a different time tone to indicate class change.
    f. Each of the unlimited Time Tones may be manually activated by selected VoIP Admin Phones or via an authorized user with access to the Web UI. These tones shall remain active as long as the telephone remains off-hook or until canceled from the keypad or the Nyquist Web UI.
    g. Systems that do not provide an unlimited number of schedules or do not provide automatic activation of schedules shall not be acceptable.
16. Internal Master Clock shall be included, allowing an unlimited number of events per facility. Systems that do not provide an internal master clock or that must supply an external master clock to meet these specifications shall not be acceptable.
17. The Nyquist E7000 is capable of synchronizing with an NTP server and automatically adjusting the Daylight Savings Time for any time zone in the world. The server that the Nyquist E7000 application is running on can also be used as an NTP server for other systems on the LAN (for example, IP Clocks and control systems). System shall communicate and synchronize with master clock that controls the wireless master clock system.
18. There shall be a Zone Page/All-Call Page feature that is accessible by selected Admin Phones and FXO/FXS or SIP connection to the PSTN or PBX/iPBX.
19. There shall be an option to play a pre-announce tone at any loudspeaker selected for voice paging.
20. There shall be a voice-intercom feature that is accessible by CoS authorized staff phones, all Admin VoIP phones, and Admin Web UIs.

21. System programming shall be from an authorized Nyquist Admin User via any web browser. A valid username and password shall be required to gain access to the following programmable functions:
    a. System Parameters – Allow installers to adjust core system parameters.
    b. Zones – Allow installers to create and modify Paging, Time, and Audio Zones.
    c. Schedules – Allow installers and administrators to create Bell Schedules for the facility, predefine alternative schedules to run. Holiday Events prevent the bells from ringing on a school holiday. The system shall allow an unlimited number of schedules to operate simultaneous within a facility.
    d. Admin Groups – Allow the installer to create, modify, and delete software groupings of admin phones that can ring when a station calls in with a call switch.
    e. CoS Configuration – Allow the installer to create, modify, and delete CoS groups that can have the following features defined: Call in Level, Zone Paging, All-Call Paging, Emergency All-Call, Inter-Facility Call/Page, Audio Distribution, Remote Pickup, Join Conversation, Call Forwarding, Walking Class of Service, External Call Routing, Call Transfer/3-way Calling, Manually Activate Tone Signals, Call any Station, Manage Recording, Monitor Calls, Monitor Locations, Conference Admin, Conference User, Voicemail, Record Calls, Activate Alarm Signals, Disable Audio, Enable Audio, Allow Call Auto-answer, District Paging, Inter-Facility Features, and Execute Routines.
    f. Stations – Allow the installer to set up, modify, delete stations, set up Page Exclusion, view stations' status, and add a station.
    g. Bridge Devices – Allow the installer to install the Nyquist ASBs.
    h. Audio – Allow the installer to upload and manage Announcements, Playlists, Announcements, Songs, and Tones. The must support the uploading of both MP3 and WAV files making Audio file management simple for users. Systems that limit the size of Audio files shall not be considered equal.
    i. Users – Allow the installer to manage users by giving them the proper Role and assign an Extension if needed.
    j. Roles – Allow the installer to limit user to the following: create, delete, edit, restart server, sort menu, systems update, manage, import/export, restore, settings, or view.
    k. Facilities – Allow the installer to set up the district wide facilities for remote paging and calling.
    l. Outside Line – allow the installer to set up FXS and FXO ports for inbound and outbound system calling.
    m. SIP Trunks – allow the installer to set up SIP trunks into the facility for inbound or outbound calling.
    n. Call Details – allow the installer to review the historical system activities that can be used for incident investigation or system troubleshooting.
    o. System Backup/Restore – allow the installer to preform system backup or restores and allow the backups to be schedule to run automatically.
    p. System Logs – allow the installer to view and export Server, Nyquist-Intercom, and Web Server logs that can be used for trouble shooting and technical assistance.
    q. Paging Exclusions – allow the installer to view and edit station that are excluded from paging.
    r. Firmware – is used to update Nyquist appliances.
    s. Routines – Allow installers to create routines that are a sequence of actions, that the Nyquist system executes as a result of an input trigger. Routines can support crisis plans for situations such as school lockdown, weather events, or emergency evacuations
    t. Alert Filters – Allow installers to select the National Weather Alerts that the facility needs to monitor for such as weather events, earthquakes, tsunami, volcanoes, public health, power outages, and many other emergencies.
    u. Help –Provides information about the system, online help topics, and System Administrator Manual.

v. Systems not capable of supporting web-based configuration and control, or require plug-in or dedicated application software, shall not be deemed as equal.
w. Systems that require a Serial-to-Ethernet converter, or require additional application software on a PC for configuration and/or control shall not be deemed as equal.

22. Firmware - Installers can manage the available firmware. Because the Nyquist E7000 is constantly evolving and changing new versions of firmware will become available and the Firmware section allow installers or authorized users the ability to upload, check for updates, or configure the system to automatically download new firmware for later installation. Systems that can't automatically check for new software are not considered equivalent.
23. Routines are designed to automatically launch a procedure, or sequence of actions, that the Nyquist system executes as a result of an input trigger.
24. Some of the events (triggered by dashboard, IP Phone, I/O Controller contact, or Routines API) that can be created are as follows:
    a. Lockdown Routines
    b. Emergency Evacuation Routines
    c. Fire Alarm Routines
    d. Weather Alert Routines
25. Alert Filters Configuration - The Common Alerting Protocol (CAP) is an international standard format for emergency alerting and public warning. It is designed for all hazards related to weather events, earthquakes, tornado, tsunami, volcanoes, public health, power outages, and many other emergencies.
26. CAP elements and values are used when configuring alert filters for your Nyquist system. This part of the configuration allows installers to select or "Enable" or disable the filters needed for each facility. This filtered information can then be displayed on the NQ-GA10PV through the campus.
27. The growing list of information that can currently be displayed are as follows: 911 Telephone Outage, Administrative Message, Air Quality Alert, Air Stagnation Advisory, Arroyo And Small Stream Flood Advisory, Ashfall Advisory, Ashfall Warning, Avalanche Advisory, Avalanche Warning, Avalanche Watch, Beach Hazards Statement, Blizzard Warning, Blizzard Watch, Blowing Dust Advisory, Blowing Dust Warning, Brisk Wind Advisory, Child Abduction Emergency, Civil Danger Warning, Civil Emergency Message, Coastal Flood Advisory, Coastal Flood Statement, Coastal Flood Warning, Coastal Flood Watch, Dense Fog Advisory, Dense Smoke Advisory, Dust Advisory, Dust Storm Warning, Earthquake Warning, Evacuation - Immediate, Excessive Heat Warning, Excessive Heat Watch, Extreme Cold Warning, Extreme Cold Watch, Extreme Fire Danger, Extreme Wind Warning, Fire Warning, Fire Weather Watch, Flash Flood Statement, Flash Flood Warning, Flash Flood Watch, Flood Advisory, Flood Statement, Flood Warning, Flood Watch, Freeze Warning, Freeze Watch, Freezing Fog Advisory, Freezing Rain Advisory, Freezing Spray Advisory, Frost Advisory, Gale Warning, Gale Watch, Hard Freeze Warning, Hard Freeze Watch, Hazardous Materials Warning, Hazardous Seas Warning, Hazardous Seas Watch, Hazardous Weather Outlook, Heat Advisory, Heavy Freezing Spray Warning, Heavy Freezing Spray Watch, High Surf Advisory, High Surf Warning, High Wind Warning, High Wind Watch, Hurricane Force Wind Warning, Hurricane Force Wind Watch, Hurricane Local Statement, Hurricane Warning, Hurricane Watch, Hydrologic Advisory, Hydrologic Outlook, Ice Storm Warning, Lake Effect Snow Advisory, Lake Effect Snow Warning, Lake Effect Snow Watch, Lake Wind Advisory, Lakeshore Flood Advisory, Lakeshore Flood Statement, Lakeshore Flood Warning, Lakeshore Flood Watch, Law Enforcement Warning, Local Area Emergency, Low Water Advisory, Marine Weather Statement, Nuclear Power Plant Warning, Radiological Hazard Warning, Red Flag Warning, Rip Current Statement, Severe Thunderstorm Warning, Severe Thunderstorm Watch, Severe Weather Statement, Shelter In Place Warning, Short Term Forecast, Small Craft Advisory, Small Craft Advisory For Hazardous Seas, Small Craft Advisory For Rough Bar, Small Craft Advisory For Winds, Small Stream Flood Advisory, Snow Squall Warning, Special Marine Warning, Special Weather Statement, Storm Surge Warning, Storm Surge Watch, Storm Warning, Storm Watch, Test, Tornado Warning, Tornado Watch, Tropical

Depression Local Statement, Tropical Storm Local Statement, Tropical Storm Warning, Tropical Storm Watch, Tsunami Advisory, Tsunami Warning, Tsunami Watch, Typhoon Local Statement, Typhoon Warning, Typhoon Watch, Urban And Small Stream Flood Advisory, Volcano Warning, Wind Advisory, Wind Chill Advisory, Wind Chill Warning, Wind Chill Watch, Winter Storm Warning, Winter Storm Watch, and Winter Weather Advisory.

28. Systems that are not capable of displaying National Weather Service CAP information to give advanced warning to facilities shall not be considered equal.

B. System Controller (Bogen NQ-SYSCTRL or approved equal)
   1. Configuration and management via a Web-based Graphical User Interface (GUI)
   2. Wizard based setup for quick installation
   3. Remote access from virtually any PC/MAC, tablet, or mobile device
   4. Continuous monitoring of stations and appliances to ensure system operation
   5. Dual network adapters to allow the System Controller to operate on two separate networks
   6. Music automatically added to music library and playlist from USB port
   7. Network-based audio that can be sourced (input) from any number of Nyquist appliances (NQ-P0100, NQ-A2xxx, NQ-A4xxx, etc.)
   8. Ample storage for music files, recorded announcements, and call recordings
   9. G722 and OPUS audio codec support to deliver superior HD audio quality
   10. Convection air cooled; fan-less design for quiet, maintenance-free operation
   11. Wall, rack, or shelf mountable. Provide MFGR rack mounting hardware.

C. Amplifers
   1. Amplifiers shall be Bogen model NQ-PA120 Mixer/Amplifer or approved equal, rated at 120 watts RMS with manufacturer provided rack mounting hardware. Provide amplifiers as indicated in drawings.
   2. The amplifier shall accommodate up to 6 Lo-Z balanced microphones, 2 Hi-Z auxiliary sources and a telephone paging input (MIC 5 shall be switch-selected for MIC or telephone line; MIC 6 switch-selected for MIC or AUX 1). MIC 1 through 4 shall use XLR-type connectors; AUX inputs shall be via RCA phono jacks and all other connectors shall use pluggable screw terminals. Phantom power shall be supplied for use with condenser microphones. Microphone precedence connections shall be included for MIC 1, 2, 3, 5/TEL, 6/AUX 1 and AUX 2.
   3. The amplifier shall provide a frequency response from 65 Hz to 20 kHz +0/-2 dB at rated power. Distortion shall be 0.3% typically.
   4. The amplifier shall include an Audio Enhancement circuit, variable loudness contour control, and dual function equalizer. The equalizer shall be switch selectable for feedback control or acoustic shaping and shall include 10 center-detent slide controls providing ±12 dB of boost or cut from 62.5 Hz to 16 kHz in acoustic mode and from 125Hz to 8 kHz in feedback control mode.
   5. The amplifier shall include automatic level control to provide consistent output regardless of who is paging, automatic muting complete with a VOX circuit, and a variable mute level. Provisions shall also be included for remote volume control, using an accessory control unit (GSRVC).
   6. Outputs shall be provided for 4- and 8-ohm speakers and for 25V, 25VCT and 70V distributed systems. Additional outputs shall be provided to feed a booster amp and recorder. A dedicated output shall permit feeding a 600-ohm telephone line using an accessory transformer (Model WMT1A). A Pre-Amp Out/Power-Amp In circuit shall be provided to insert signal processing equipment.
   7. The amplifier shall be rack mountable using MFRG provide rack mounting kit. It shall carry the necessary safety agency listings for both the US and Canada.

D. Input/Output Controller (Bogen NQ-E7010 or approved equal)
   1. Power over Ethernet 802.3af compliant
   2. 8 x Dry Contact Closure Inputs
   3. 8 x Relay Driver Outputs (Open-Collector)
   4. USB 2.0 host port, Type-A connector (future use)

5. Software programmable configuration and operation including; Contact Type, Extension, Name, Close Interval, Actions (911, Audio, Alarm, Announcement, All-Call, Multi-Site-Emergency-All-Call, Emergency-Call, Emergency-All-Call, Hourly, Audio-Disabled, No Action, Page, Tone, Enable-Audio and Manual), Action ID, Zones, Close Extension, Dashboard Type, Dashboard Title, Dashboard Scope, Dashboard Text, Dashboard Style, Email and Routines
6. Wall, rack, or shelf mountable. Provide MFGR rack mounting hardware.

E. Zone Paging Microphone Station (Bogen NQ-ZPMS or approved equal)
1. 112 one-touch DSS keys on 10.1” capacity color touch screen
2. HD audio on speaker and handset
3. Built-in Bluetooth 5.0 and 2.4G/5G Wi-Fi
4. Dual Gigabit ports, integrated PoE
5. Stand with 2 adjustable angles of 40 and 50 degrees
6. HD Voice Microphone/Speaker
7. HAC handset
8. Wideband ADC/DAC 16KHz Sampling
9. Narrowband Codec: G.711a/u
10. Wideband Codec: G.722
11. Full-duplex Acoustic Echo Canceller (AEC)
12. Noise Reduction (NR)
13. Packet Loss Concealment (PLC)
14. Dynamic Adaptive Jitter Buffer
15. Android 9.0 OS with higher security and better compatibility
16. Built-in Applications: Files, Calendar, Gallery, Browser, Email, Calculator, Notepad, Sound Recorder, Clock, Video, Music
17. Call logs (In/out/missed, 1000 entries)
18. Screen saver
19. Voice Message Waiting Indication (VMWI)
20. UI Programmable DSS/Soft keys
21. Network Time Synchronization
22. Built-in Bluetooth 5.0: Support Bluetooth headset / Bluetooth of Mobile Devices
23. Built-in Wi-Fi - 2.4GHz, 802.11 b/g/n - 5GHz, 802.11 a/n/ac

2.03 COMPONENTS

A. CD Player and AM/FM Receiver:.
1. The auxiliary program source shall be a Bogen Model CDR1 CD Player with AM/FM Receiver, or equivalent.
2. The program source shall include manual tuning and auto seek control. The auto seek control shall automatically ascend (or descend) the frequency scale to the next strong frequency. It shall be possible to program up to 5 bands (FM1, FM2, FM3, AM1, AM2) with up to 6 stations each for a total of 30 stations. A preset scan control shall be provided to scroll and select from available presets. The FM section shall have a frequency range from 87.5 MHz - 108 MHz, the AM section will have a frequency range of 530 kHz - 1710 kHz. Pluggable screw terminal inputs shall be available for an AM loop antenna, a FM dipole antenna, and for speaker outputs. An F-type coax antenna connector shall also be available.
3. The CD player system shall include Browse, Repeat, Random Play, and Pause functions. The CD player shall be capable of playing CD, CD-R, or CD-RW discs (including MP3 files).
4. The CDR1 shall have a frequency response of 20 Hz - 20 kHz (< 5 dB).
5. The following controls shall be provided: Power/ Volume, Disc Eject, Mode (Radio, CD, AUX), Audio/Menu Select (Volume, Bass, Treble, Balance, Display, Seek, and Clock), Mute, Scan, Stereo/Mono, Station Store/Select, Loudness Contour, Band, and Station Select. An LCD digital readout shall be provided to show selected frequency and band (in Radio Mode) or track (in CD Mode) information.

6. The unit shall operate on 12V DC (3A) power with an included desktop-style AC power adapter. It shall be possible to drive 8-ohm loudspeakers directly from 1W per channel (Right/Left) outputs. A 50-ohm mono-summed RCA output shall also be available, in addition to stereo.
7. The unit shall be 7-1/4" W × 2-1/8" H × 9-1/4" D and shall weigh 4 lb. The unit shall mount in a standard 19-inch rack system (2 rack spaces high) with the RK78 rack mounting kit.
8. Provide a matrix mixer pre-amp Bogen NQ-P0100 or approved equal. Provide MFGR rack mounting hardware.

B. Microphone: Desk type low impedance microphone with push-to-talk switch.
1. Product: Bogen DDU250 or approved equal.
2. Substitutions: See Section 01 60 00 - Product Requirements.

C. Ceiling Speakers w/volume control
1. Product: Bogen M/N CSD2X2VRU or approved equal.
2. Substitutions: See Section 01 60 00 - Product Requirements.

D. Wall Mount Speaker Baffles and Enclosure: Square, painted steel, with uniform perforations, and volume control
1. Product: Bogen M/N MB8TSLVR or approved equal.
2. Substitutions: See Section 01 60 00 - Product Requirements.

E. Horns: Wide dispersion indoor/outdoor horn with driver.
1. Product: Bogen M/N SPT15A or approved equal.
2. Substitutions: See Section 01 60 00 - Product Requirements.

F. Telephone Interface: 600 ohm - auxiliary input.
1. Product: Bogen M/N UTI1 or approved equal.
2. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 WIRE AND CABLE

A. Microphone Cord: 18 AWG stranded copper conductor, 600 volt insulation, rated 60 degrees C, four conductor shielded cable with rubber jacket. Cable shall be plenum rated.

B. Plenum Cable for Speaker Circuits: 18 AWG copper conductor, 300 volt insulation, rated 200 degrees C, paired conductors twisted together shielded and covered with a nonmetallic jacket; suitable for use for Class 2 circuits in air handling ducts, hollow spaces used as ducts, and plenums.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Equipment Manufacturer's Representative
1. All work described herein to be done by the manufacturer's authorized representative shall be provided by a documented factory authorized representative of the basic line of equipment to be utilized.
2. As further qualification for bidding and participating in the work under this specification, the manufacturer's representative shall hold a valid C-10 Contractor's License issued by the Contractor's State License Board of [your state]. The manufacturer's representative shall have completed at least 10 projects of equal scope, giving satisfactory performance, and shall have been in the business of furnishing and installing sound systems of this type for at least five years. The manufacturer's representative shall be capable of being bonded to ensure the owner of performance and satisfactory service during the guarantee period.
3. The manufacturer's representative shall provide a letter with submittals from the manufacturer of all major equipment stating that the manufacturer's representative is an authorized distributor. This letter shall also state that the manufacturer guarantees service performance for the life of the equipment and that there will always be an authorized distributor assigned to service the area in which the system has been installed.

4. The contractor shall furnish a letter from the manufacturer of the equipment. This letter shall certify that the equipment has been installed according to factory intended practices, that all the components used in the system are compatible, and that all new portions of the systems are operating satisfactorily. Further, the contractor shall furnish a written unconditional guarantee, guaranteeing all parts and all labor for a period of five years after final acceptance of the project by the owner.

C. Division of Work
   1. While all work included under this specification is the complete responsibility of the contractor, the following division of actual work listed shall occur:
   2. The conduit, outlets, terminal cabinets, etc., which form part of the rough-in work, shall be furnished and installed completely by the electrical contractor.
   3. The balance of the system, including installation of speakers and equipment, making all connections, etc., shall be performed by the manufacturer's authorized representative. The entire responsibility of the system, its operation, function, testing and complete maintenance for one year after final acceptance of the project by the owner, shall also be the responsibility of the manufacturer's authorized representative.

D. Mounting Heights: Coordinate locations of outlet boxes specified in Section 26 05 37 to obtain mounting heights indicated.
   1. Wall-mounted Speaker: 8 feet above finished floor or just below ceiling whichever is lower unless otherwise indicated. Provide single gang, recesses metal box behind wall mounted speaker. Wiring to speaker shall be run concealed in wall through metal box to speaker. Wiring in CMU walls shall be run in 3/4" EMT from stub up to and into ceiling space above. If no ceiling exists, the conduit shall be run to location just about the bottom of the structural steel supporting the decking/floor above.
   2. Horns: 10 feet above finished floor or just below ceiling whichever is lower unless otherwise indicated. Provide single gang, recesses metal box behind wall mounted speaker. Wiring to speaker shall be run concealed in wall through metal box to speaker. Wiring in CMU walls shall be run in 3/4" EMT from stub up to and into ceiling space above. If no ceiling exists, the conduit shall be run to location just above the bottom of the structural steel supporting the decking/floor above.
   3. Microphone Outlets: 1.5 feet above finished floor unless otherwise indicated.

E. Splice cable only in accessible junction boxes or at terminal block units.

F. Wiring
   1. System wiring and equipment installation shall be in accordance with generally accepted engineering best practices as established by the EIA and the NEC. Wiring shall meet all state and local electrical codes. All wiring shall be tested to be free from grounds and shorts.
   2. All system wiring shall be labeled at both ends of the cable. All labeling shall be based on the room numbers as indicated in the architectural graphics package.
   3. All terminal connections are to be on barrier strips.

G. Make cable shields continuous at splices and connect speaker circuit shield to equipment ground only at amplifier.

H. Install input circuits in separate cables and raceways from output circuits.

I. Leave 18 inches excess cable at each termination at microphone, volume pad, speaker, and other system outlet.

J. Leave 6 feet excess cable at each termination at system cabinet

K. Provide protection for exposed cables where subject to damage.

L. Use armored cable for outside speaker circuits.

M. Support cables above accessible ceilings to keep them from resting on ceiling tiles. Use spring metal clips or plastic cable ties to support cables from structure for ceiling suspension system. Include bridle rings or drive rings.

N. Use suitable cable fittings and connectors.

O. Connect reproducers to amplifier with matching transformers.

P. Ground and bond equipment and circuits in accordance with Section 26 05 26.

Q. Provide all required appropriate cabling to connect microphone preamplifier to amplifer. Cabling shall be plenum rated and run concealed in walls, above ceilings, and in conduit (if exposed).

R. Plug disconnect: All major equipment components shall be fully pluggable by means of multi-pin receptacles and matching plugs to provide for ease of maintenance and service.

S. Protection of cables: Cables within terminal cabinets, equipment racks, etc., shall be grouped and bundled (harnessed) as to type and laced with No. 12 cord waxed linen lacing twine or T and B wire-ties, or hook and loop cable management. Edge protection material shall be installed on edges of holes, lips of ducts, or any other point where cables or harnesses cross a metallic edge.

T. Cable identification: Cable conductors shall be color-coded and individual cables shall be individually identified. Each cable identification shall have a unique number located approximately 1-1/2" from cable connection at both ends of cable. Numbers shall be approximately 1/4" in height. These unique numbers shall appear on the As-Built Drawings.

U. Shielding: Cable shielding shall be capable of being connected to common ground at point of lowest audio level and shall be free from ground at any other point. Cable shields shall be terminated in the same manner as conductors.

V. Grounding
   1. The contractor shall provide equipment grounding connections for Integrated Telecommunications/Time/Audio/Media System as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to ensure permanent and effective grounds.
   2. The contractor shall provide ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments.
   3. The contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.
   4. The contractor shall note on their drawings the type and locations of these protection devices and all wiring information.
   5. The contractor shall furnish and install a dedicated, isolated earth ground from the central equipment rack and bond to the incoming electrical service ground buss bar.

3.02 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Provide the services of manufacturer's technical representative to prepare and start system.
   1. Include making of final wiring connections, inspection and adjusting of completed installation, and systems demonstration.
   2. Certify that installation is complete and performs according to specified requirements.

C. Measure and record sound power levels at designated locations.

3.03 ADJUSTING

A. Adjust transformer taps and volume controls for appropriate sound level.

B. Adjust devices and wall plates to be flush and level.

3.04 CLOSEOUT ACTIVITIES

A. See Section 01 79 00 - Demonstration and Training, for additional requirements.

B. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Conduct walking tour of project.
   3. Briefly describe function, operation, and maintenance of each component.

C. Training: Train Owner's personnel on operation and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of four hours of training.
3. Instructor: Manufacturer's training personnel.
4. Location: At project site.

D. Owner Requested Volume Adjustments: Provide 16 hours of contractor personnel time to adjust speaker volume as directed by Owner.

3.05 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide service and maintenance of public address and music system for one year from Date of Substantial Completion.

END OF SECTION

SECTION 27 53 13
WIRELESS CLOCK SYSTEM

GENERAL

1.01 SUMMARY OF WORK

A. This Section specifies materials and accessories for a wireless clock system.

B. Section Includes:
   1. Master clock;
   2. Elapsed timer control panel;
   3. Repeaters;
   4. Secondary analog clock.

1.02 REFERENCE STANDARDS

A. Federal Communications Division (FCC)

PART 15 - CODE OF FEDERAL REGULATIONS.

2.01 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA).

A. NFPA 70E-[2012], Standard for Electrical safety in the Workplace.

B. US Green Building Council (USGBC).
   1. LEED® NC Version 2.2-[2009], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package for New Construction and Major Renovations.

C. Underwriter's Laboratories (UL).
   1. UL

2.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate work of this Section with communications and electronics work and with work of other trades for proper time and sequence to avoid construction delays.

2.03 ACTION AND INFORMATIONAL SUBMITTALS

A. Make submittals in accordance with Contract Conditions and Section 01 30 00 - Submittal Procedures.

B. Product Data: Submit product data including manufacturer's literature for clock system materials and accessories, indicating compliance with specified requirements and material characteristics.
   1. Submit list on clock system manufacturer's letterhead of materials and accessories to be incorporated into Work.
   2. Include product name.
   3. Include preparation instructions and recommendations, installation methods, and storage and handling requirements.
   4. Include contact information for manufacturer and their representative for this Project.

C. Shop Drawings: Submit shop drawings with information as follows:
   1. Diagram of proposed system showing system platform appliance, communication pathway, and schedule of individual device locations.
   2. Indicate integration with the Owner's network and servers. Include line diagram of network relationships.
   3. Show system power requirements.

D. Samples:
   1. Submit one sample of each type of device used on project. Samples will be returned Contractor for incorporation into the Work after Consultant's review.

E. Test Reports:
   1. Submit evaluation and test reports or other independent testing agency reports showing compliance with specified performance characteristics and physical properties.

F. Subcontractor Experience: Submit verification of communication and electronics subcontractor's experience.

G. Manufacturer's Authorization: Submit verification of communication and electronics subcontractor's authorization from clock system manufacturer to perform Work of this section.

2.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Supply maintenance data for clock system for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

B. Record Documentation: In accordance with Section 01 78 00 - Closeout Submittals.
   1. List materials used in clock system work.
   2. Warranty: Submit warranty documents specified.

2.05 QUALITY ASSURANCE

A. Communications and Electronics Subcontractor Quality Assurance:
   1. Work experience of 3 years minimum with work similar to work of this Section.
   2. Manufacturer's authorization to perform work of this section.

B. Supplier's Accreditation: Use only suppliers accredited by clock system manufacturer.

C. Supplier's Maintenance Requirements:
   1. Ensure local supplier has adequate facility for storage of spare parts for clock system.

2.06 DELIVERY STORAGE AND HANDLING

A. Delivery and Acceptance Requirements:
   1. Deliver material in accordance with Section 01 60 00 - Common Product Requirements.
   2. Deliver materials and accessories in clock system manufacture's original packaging with identification labels intact and to suit project.
   3. Ensure clock system materials are not exposed to moisture during delivery.
   4. Replace damaged clock system materials.

B. Storage and Handling Requirements: Store materials off ground in dry location and protected from exposure to fumes and harmful weather conditions and at temperature conditions recommended by manufacturer.
   1. Store in original packaging until installed.

C. Packaging Waste Management:
   1. Separate and recycle waste packaging materials in accordance with Section 01 74 19 - Construction Waste Management and Disposal.
   2. Remove waste packaging materials from site and dispose of packaging materials at appropriate recycling facilities.
   3. Collect and separate for disposal, paper and plastic material in appropriate on-site storage containers for recycling in accordance with Waste Management Plan.

2.07 WARRANTY

A. Project Warranty: Refer to Contract Conditions for project warranty provisions.

B. Manufacturer's warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not intended to limit other rights Owner may have under Contract Conditions. Whether or not covered under manufacturer's standard warranty, coverage shall include parts and labor.

C. Warranty period: 2 years commencing on Date of Project Substantial Completion.

2.08 PRODUCTS

2.09 MANUFACTURER

A. Basis of design will be Sapling Inc., 1633 Republic Rd Huntingdon Valley, PA 19006, Phone: 1-215-322-6063, URL: www.sapling-inc.com. Bogen is an approved manufacturer as well.

B. Substitutions will be considered only if submitted at least 10 days prior to bid for consideration and possible approval.

2.10 SYSTEM REQUIREMENTS

A. Ensure clock system components are designed to operate as a wireless clock system and as part of complete system including “fail-proof” design to ensure power interruption does not cause system failure.

B. Ensure system synchronizes all clocks and devices to each other.

C. Ensure system does not require FCC licensing.

D. Ensure system uses frequency-hopping technology.

E. Ensure system is capable of correcting clocks immediately upon receipt of wireless signal.
   1. Analog and digital clocks automatically correct themselves on receipt of wireless signal.
   2. Include built-in closed-loop system in analog clocks capable of allowing clocks to detect position of hands and bring clocks to correct time even if clocks are manually altered.
   3. Ensure analog clocks have diagnostic function capable of allowing user to view how long since clock received wireless signal.
   4. Ensure analog clocks are capable of functional tests of electronics and gears.

F. Ensure each individual product is bench tested at manufacturer’s facility.
   1. Random testing is unacceptable.

G. Ensure each product is designed, assembled and tested in the United States of America.

H. Basis of Design: Sapling Inc., Wireless Clock System.

2.11 MASTER CLOCK

A. Master Clock Type 1: To UL and cUL 863.
   1. Ensure master clock includes 10 pre-programmed (S)NTP backup addresses.
   2. Ensure master clock is capable of receiving (S)NTP time signal via Ethernet.
   3. Ensure master clock is capable of receiving digital signals through RS485 connection.

B. Ensure master clock is capable of correcting secondary clocks for Daylight Saving Time
   1. Ensure master clock is capable of customizing Daylight Saving Time, in the event of international use or a change in government regulations.

C. Ensure master clock is capable of outputting RS485 signals.
   1. Ensure master clock has two clock circuits capable of outputting signals including:

D. 59 minute correction;

E. 58 minute correction;

F. National Time or Rauland correction;

G. Once a day pulse;

H. Rauland digital correction.
   1. Communications Interface: Ensure master clock system is capable of being programmed remotely through online interface accessible through LAN and compatible with Microsoft Internet Explorer and Mozilla Firefox web browsers.

I. Ensure interface includes functions as follows:

J. Allow users to schedule bells and other events;

K. Display features;

L. Show IP settings;

M. Show other master clock settings;

N. Set time and date;

O. Download or upload master clock settings;

P. Configure e-mail alerts for various instances.
   1. Display: Two row, 20 character LED and backlit LED display and 2 x 8 inch rubber keypad for operator programming.

2. Optional relays: Include 4 relays to ensure master clock is capable of utilizing 4 zones that can be used for scheduling facility systems as follows:
   a. Bells if needed
3. Lights if needed

Q. Allow for programming of master clock through 16 button rubber tactile keypad or built-in web interface.

R. Ensure master clock can contain up to 800 events.

S. Ensure master clock can contain up to 255 schedule changes.

T. Clock System: Wireless with transmitter to FCC, Part 15.
1. Transmitter: Capable of transmitting data to SAL wireless analog and SBL wireless digital clocks, and receiving signal from (S)NTP time server
2. Automatic bi-annual Daylight Savings Time changes.

U. Countdown for Digital Clocks: Ensure master clock is capable of having digital clocks counting down time between events.

V. Power Requirements: 110 V AC, 60Hz
1. Ensure master clock is capable of 10 years battery power backup in event of power failure.

W. Basis of design: Sapling Inc., SMA 3000 Series Master Clock.

2.12 REPEATERS

A. Wireless Repeater: Capable of wirelessly transmitting and receiving data and compliant with FCC, Part 15.
1. Input voltage: 85 - 230 V AC;
2. Input: RS485. Sapling Wireless Communications;
3. Input source: Master clock or Secondary Sapling Wireless Clock;
4. RF power output: 30 dBM (1 Watt);
5. Operation frequency range: 915-928 MHz frequency hopping technology;
6. Mounting: Wall mount;
7. Housing: 11 x 8 x 17 inches black smooth surface metal enclosure.
8. Basis for design: Sapling Inc., Wireless Repeater.

B. Network Repeater: Capable of receiving time signal through TCP/IP from master clock and compliant with FCC, Part 15.
1. Input voltage: 85 - 230 V AC;
2. Input: RJ45;
3. Input source: Master clock;
4. RF power output: 30 dBM (1 Watt);
5. Frequency range: 915-928 MHz frequency hopping technology;
6. Mounting: Wall mount;
7. Housing: 11 x 8 x 17 inches black smooth surface metal enclosure with 7 inch antennae.
8. Basis for design: Sapling Inc., Network Repeater.

2.13 SECONDARY CLOCKS

A. Analog Clocks: To UL and cUL 863, designed for wireless system with fully automatic plug and play capability.
1. Ensure secondary clock is capable of receiving wireless signals from master clock.
2. Ensure each secondary clock works as an RF signal repeater, establishing a Mesh Network.
3. Clock display: 12 hour white face with black numbers custom logo.
4. Ensure analog secondary clock is capable of receiving Sapling wireless signals every two (2) or four (4) hours for battery models and every minute for 24 V / 110V model.
5. Materials:
   a. Dial: Polystyrene
   b. Case: Shallow profile, smooth surface ABS
   c. Crystal: Shatter-proof, side-molded, polycarbonate.

6. Hand tolerance:
    a. Hour and minute hands: ±1/4 minute.
    b. Second hand: ± 1/2 minute.
7. Power Requirements: Battery operated.
    a. Batteries: 2 “D” cell batteries.
        1) Basis for design: Duracell Procell “D” Cell batteries.
8. Basis of design: Sapling Inc., SAL-4 Series Wireless Round Clock.

2.14 SOURCE QUALITY CONTROL

A. Ensure clock system components and accessories are supplied or approved in writing by single manufacturer.

2.15 EXECUTION

2.16 INSTALLERS

A. Use only installers with 3 years verified minimum experience with work similar to work of this Section.

B. Ensure all clock system components are installed by single communications and electronics subcontractor.

2.17 EXAMINATION

A. Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for clock system installation in accordance with manufacturer’s written recommendations.
    1. Visually inspect substrate in presence of Consultant.
    2. Ensure surfaces are free of snow, ice, frost, grease and other deleterious materials.
    3. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

B. Start of clock system installation indicates installer’s acceptance of substrate installation conditions.

2.18 INSTALLATION

A. Install wireless clock system in accordance with manufacturer’s written recommendations and in accordance with NFPA 70E.

B. Integrate clock system with Owner’s electrical and communications network.

C. Install wiring in accordance with requirements of local Authority Having Jurisdiction and applicable specifications.

D. Conceal wiring except in unfinished spaces and as approved in writing by Architect/Engineer.

E. Install clocks only after painting and other finish work is completed in each room.

F. Install clocks and other devices square and plumb.

2.19 FIELD QUALITY CONTROL

A. Field Inspection: Coordinate field inspection in accordance with Section 01 40 00 - Quality Control.

2.20 SYSTEM STARTUP

A. At completion of installation and before final acceptance, turn on equipment and ensure equipment is operating properly, and clock system devices and components are functioning.

B. Evaluate and test each device in clock system on room-by-room basis using factory-trained technicians.
    1. Fix or replace devices which fail test or are functioning incorrectly.
    2. Submit evaluation and report showing results of room-by-room tests and overall system compliance within 3 days of testing being carried out.

2.21 CLEANING

A. Progress Cleaning: Perform cleanup as work progresses in accordance with Section 01 74 00 - Cleaning and Waste Management.
   1. Leave work area clean at end of each day.

B. Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 00 - Cleaning and Waste Management.

C. Waste Management:
   1. Co-ordinate recycling of waste materials with 01 74 19 - Construction Waste Management and Disposal.
   2. Collect recyclable waste and dispose of or recycle field generated construction waste created during construction or final cleaning related to work of this Section.
   3. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

2.22 DEMONSTRATION AND TRAINING

A. Arrange system demonstration and training session for Owner’s operation and maintenance personnel.
   1. Allow Owner and Consultant 10 days minimum advance notice before training session.

B. Break down system demonstration and training session into logical segments for Owner’s operations and maintenance personnel.

C. Train Owner’s maintenance personnel in procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of clock system.

2.23 SYSTEM COMMISSIONING

A. Do clock system commissioning in accordance with Manufacturer’s instructions.

2.24 PROTECTION

A. Protect installed products and accessories from damage during construction.

B. Repair damage to adjacent materials caused by clock system installation.

END OF SECTION

SECTION 281500

INTEGRATED ACCESS CONTROL HARDWARE DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes access control door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Section includes, but is not necessarily limited to, the following for the integrated access control security and site management system:

1. Electrified and Integrated Access Control Card Key Door Hardware

C. Related Sections include the following:

1. Division 01 Section “Cash Allowances”.
2. Division 01 Section “Product Allowances”.
3. Division 08 Section “Door Schedule”.
4. Division 08 Section “Door Hardware Schedule”.
5. Division 08 Section "Hollow Metal Doors and Frames."
6. Division 08 Section "Flush Wood Doors".
7. Division 08 Section "Clad Wood Doors".
8. Division 08 Section "Stile and Rail Wood Doors".
9. Division 08 Section “Fiberglass Doors”,
10. Division 08 Section "Integrated Door Opening Assemblies".
11. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
12. Division 08 Section "All-Glass Entrances".
13. Division 08 Section "Automatic Entrances".
14. Division 08 Section "Door Hardware".
15. Division 08 Section "Automatic Door Operators".
16. Division 14 Section "Elevators" for security access to elevator floor selection controls.
17. Division 26 Section "Electrical" for connections to electrical power system and for low voltage wiring work.
18. Division 27 Section "Communications" for connections to the LAN.
19. Division 28 Section "Access Control" for access control devices and equipment installed at door openings and provided as part of a security and site management system.
20. Division 28 Section "Intrusion Detection" for detection devices installed at door openings and provided as part of an intrusion detection system.

21. Division 28 Section "Video Surveillance" for motion detection and video camera devices and equipment installed at door openings and provided as part of a security and site management system.
22. Division 28 Section "Fire Detection and Alarm" for connections to building fire alarm system.

D. References:

1. ANSI A117.1 (1998) - Accessible and Usable Buildings and Facilities.
2. IBC - International Building Code
3. NFPA 70 (2002) - National Electrical Code.
4. NFPA 80 (1999) - Fire Doors and Windows.
5. NFPA 101 (2006) - Life Safety Code.
6. UL 294 - Access Control Systems.
7. UL 1076 - Proprietary Burglar Alarm Units and Systems.

E. Products installed, but not provided under this Section include the following. Coordination to remain a requirement of this Section.

1. Security or High Security keyed cylinders, including provisions for temporary construction keying, for mechanical override at access control locking hardware to be furnished under Division 8 Section "Door Hardware".

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. System Operational Descriptions: Complete system operational narratives for the integrated access-controlled openings defining the owner's prescribed requirements for the opening functionality. Narratives include, but are not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions, and interfaces with other building control systems.

C. Shop Drawings: Details of electrified integrated locking hardware and access control firmware, indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication and control of the access control system electrified hardware and firmware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

   a. Elevation diagram of each unique access-controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
   b. Complete (risers, point-to-point) access control system block wiring diagrams.

2. Electrical Coordination: Coordinate with related Electrical Sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Proof of Certification: Upon request provide a copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider of the primary access control components.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete access control and site management installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and telephone number of the supplier/integrator providing the installation and the nearest service representatives for each item of equipment included in the system. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

1. As-Built Drawings: During system installation, the Contractor to maintain a separate hard copy set of drawings, elevation diagrams, and wiring diagrams of the access control system to be used for record drawings. This set to be kept up to date by the Contractor with all changes and additions to the access control system accurately recorded.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum of five (5) years of documented experience in providing access control and security systems equipment and software similar to that indicated for this Project and that have a proven record of successful in-service performance.

1. Software and access control systems components to have been previously and thoroughly tested together with proven installations similar in size and functionality to the design requirements indicated for this Project.

B. Supplier Qualifications: Supplier/Dealers, verifiably authorized and in good standing with the primary product manufacturers, with a minimum of three (3) years of experience supplying integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance.

1. ASSA ABLOY access control products are required to be supplied only through designated “Authorized Channel Partners.”

a. List Qualified ACP Companies

C. System Integrator Qualifications: Systems Integrators, verifiably factory trained and certified by the primary product manufacturers, with a minimum of three (3) years documented experience installing complete integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance. Qualifications include, but are not necessarily limited, to the following:

1. References: Provide a list of references for similar projects including contact name, phone number, name and type of project.
2. Professional Staffing: Firms to have a dedicated access control systems integration department with full time, experienced professionals on staff experienced in providing on

site consulting services for both electrified door hardware and integrated access control systems installations.

3. Factory Training: Installation and service technicians are to be competent factory trained and certified personnel capable of maintaining the system.
4. Service Center: Firms to have a service center capable of providing training, in-stock parts, and emergency maintenance and repairs at the Project site with 24-hour/7-days a week maximum response time.

D. Installer Qualifications: Certified technicians, verifiably authorized with the primary product manufacturers for installation of IP-Enabled, Wireless, and Power-over-Ethernet Access Control products in accordance with documented instructions and NFPA 80.

1. ASSA ABLOY access control products are required to be installed only through designated "Preferred Installers."

E. Source Limitations: Obtain the access control door hardware, system firmware and application software specified in this Section from a single source, qualified supplier/integrator unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide integrated access control door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:

1. Comply with NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1.
3. Comply with NFPA 101 "Life Safety Code" for doors in a means of egress.
4. Comply with NFPA 80 "Fire Doors and Windows" for fire labeled opening assemblies.
5. The installed access control system shall conform to all local jurisdiction requirements.

G. Keying Conference: Reference Division 8 Section "Door Hardware".

H. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier/Dealer, Systems Integrator, and Contractor to review proper methods and procedures for receiving, handling, and installing the access control system hardware. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedules.

1. Inspect and discuss Division 26 electrical roughing-in and similar preparatory work performed by other trades.
2. Review and verify sequence of operation descriptions for each unique access controlled opening.
3. Review and finalize construction schedule and verify availability of materials.
4. Review the required inspecting, testing, commissioning, and demonstration procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store electronic access control hardware, software or related accessories at Project site without prior authorization.

1. Access control firmware and software: Where approved and directed, inventory upon receipt and store electronic access control equipment in a secure, temperature and humidity controlled environment in original manufacturer's sealed containers.

B. Tag each item or package separately with identification related to the final Access Control Door Schedule, and include basic installation instructions with each item or package.

C. Deliver permanent keys, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner established at the “Pre-Submittal Conference".

1.6 COORDINATION

A. Coordinate quantity and arrangement of assemblies with ceiling space configuration and with components occupying ceiling space, including structural members, pipes, air-distribution components, raceways, cable trays, recessed lighting fixtures, and other items.

B. Access Control System Electrical Coordination: Coordinate the layout and installation of scheduled electrified door hardware, and related access control equipment, with required connections to source power junction boxes, power supplies, detection and monitoring hardware and fire alarm system.

1. Door Hardware Interface: The card key access control system to interface and be connected to electronic door control hardware (electromechanical locks, electric strikes, magnetic locks, door position switches, other monitoring contacts, and related auxiliary control devices) as described under Division 8 "Door Hardware". Coordinate the installation and configuration of specified door hardware being monitored or controlled with the controls, software and access control hardware specified in this Section.

C. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing electrified door hardware and access control system components. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing access control system hardware to comply with indicated requirements.

D. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article will not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and are in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of the installed access control system hardware and software that fails in materials or workmanship, including all related parts and labor, within specified warranty period after final testing and acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods (Electrified Access Control Door Hardware):

1. Two years for Electrified, Wiegand Output, and IP-Enabled Access Control Door Hardware.

E. Maintenance Support and Extended Service Agreement: Submit for Owner’s consideration an optional extended Service Agreement for the installed access control system, including support for software related issues. The extended Service Agreement is considered elective and is without manufacturer's requirement stipulating mandatory coverage for owner and/or vendor system support.

1. A published copy of this agreement to be included with the submittal package
2. Support for the installed access control system components is provided through the vendor under a 24 hour technical assistance program.
3. Access control and management system components are to be available on a one-day turn around time frame from the manufacturer.
4. Primary systems manufacturer to offer and provide remote modem or internet access for direct factory support to the vendor. The factory level support to include diagnostics and troubleshooting support on systems related issues at no additional cost to the owner.

F. Access Control Software Upgrades: Version upgrades and "fix" releases to the access control system software are available at no extra charge as long as the version of software provided under this specification remains the current manufacturer’s version or for up to (2) years after a new version release.

1. Major access control software revisions that provide new functionality to the product provided free of charge for up to one (1) year from the date of substantial completion.
2. Access control system software is to be upgradable as may be required or as necessary, to expand and manage the owner’s site or sites. Upgrades are to be offered at a published flat fee for the primary system software, with single license modules included in the primary fee structure. System upgrades offered at a costing structure based upon the original number of licensed modules issued, or on those to be purchased at a future date, are not allowed.
3. As part of the submittal package, provide a list of available software upgrades and/or expansions modules. List to identify related costs for upgrades, or expansions to the original system, up to the next qualifying operational level.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of the installed access control system hardware and components.

B. Maintenance Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance by skilled employees of the Systems Integrator. Include repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

1.9 SCOPE OF WORK

A. On-Line Electronic Access Control System: Furnish and install at the indicated locations the specified electrified and integrated door hardware and access control firmware and software for a completely operational access control and security site management system. System includes, but is not necessarily limited, to the following:

1. Electrified integrated card reader locks and exit hardware, permanent and temporary override cylinders, network control processors, reader controller panels, I/O monitor/control interfaces, door position switches, remote card readers, keypads, and display terminals, access cards and credentials, system application software, special tools, operating manuals, and required cabling and accessories as detailed below and listed in the Access Control Hardware Sets at the end of Part 3.

    a. Provide the appropriate number of reader controller panels and I/O monitoring/control expansion interfaces as needed to handle the number of card readers, locking devices, door status devices, and identified alarm inputs specified in this section, and as shown on the security drawings.
    b. Provide manufacturer approved integrated card reader locks, exit hardware, and remote mounted card readers, keypads, and display terminals that are functionally compatible with the specified access control equipment interfaces.

2. Access control system equipment to be installed in an enclosure box compatible with the specified components. This enclosure to include, but is not necessarily limited to, the network control processor, I/O monitor/control interface panels, power supplies, terminal strips, wire ducts, keyed lock cylinder, integrated outlet for A/C power, and standoffs.

    a. Enclosure box to be located in the designated IT/Telecom room(s) with connection to local area network for communication back to the central server host.

3. Owner to provide the following:

    a. Central server host computer, client workstations, and hardware peripherals to be from an approved, major line computer manufacturer. Specific information detailing compliance with system requirements to be included in the project submittal package as specified.
    b. Owner will be responsible for ensuring that each computer hardware component includes the required interfaces, expansion boards, and peripherals that will be necessary to allow the system to operate as described within this specification and as indicated on the drawings.
    c. Power Sourcing and Network Switches: Quantity as required to accommodate installed access control (and video surveillance) devices.

d. Network Control Processor Connections:

1) LAN/Ethernet communication ports (jacks) and network interface cards as needed, CAT5e cabling from network router/switch to network control processor, outlet and cover plates and/or patch cables required for network connection within each designated IT/Telecom room.
2) Required static IP addresses.

4. Power Supplies, including battery back up and separately fused surge protection, required for the electrified door hardware and access control equipment.
5. Installation, final configuration and commissioning of electrified door and access control system hardware, communication firmware, power supplies and related accessories.
6. System application software including installation, programming, and end user training of the access control system demonstrating operating, repair, and maintenance procedures. Include no fewer than 8 hours of on-site central server training for designated personnel (facilities maintenance, security, IT, administration) by a factory certified representative.

7. Provide manufacturer required power controllers, interface boards, and programming that may be required for approved electric latch retraction exit devices supplied under Division 08 Section "Door Hardware."
8. Electrical contractor, Division 26, to provide the following:

a. Source power wiring (120VAC) as required for the electrified locking and access control hardware, equipment, accessories and power supplies. This includes quad outlets as required on a dedicated circuit in the designated IT/Telecom room(s) and the related conduit, stub-in, junction boxes and connectors required for the source power delivery and connections.
b. Provide required conduit, stub-in, junction and back boxes for both the electrified locking hardware and access control equipment at each of the access controlled or monitored openings per plan drawings and specs. Supply and install conduit between each of the aforementioned devices and between the electrical junction boxes, power supplies and access control equipment located on or above the door opening.

1) At wall mounted remote readers, provide conduit on the secured side of the door, 36" from the finish floor and 6" from the edge of the frame, to the related power supplies and access control equipment.
2) At electrical hardware power transfers provide conduit on the secured side of the opening from the power transfer, thru-wire hinge, or serviceable panel location on the frame jamb to the related power supplies and access control equipment.

c. Electrical Contractor to provide all 120VAC cabling connections and terminations from the electrical junction boxes to these electrical devices.

9. Access Control System Integrator to provide the following:

a. Low voltage wiring (12/24VDC) and communication cabling (RS-232/RS-485) from network control processors to reader controllers, I/O monitor/control interface panels, electrified and integrated locking hardware, remote card readers, keypads, or display terminals, monitoring and signaling switches, and power supplies. Work includes related connectors, final terminations, and hook-ups required for a complete and functional access controlled opening in accordance with applicable codes and specified system operational narratives.

10. Elevator Contractor to provide the following:

    a. Interface or landing of interface cable onto the elevator call button will be performed by a certified elevator contractor.
    b. Coordinate with access control systems integrator provisions for a card reader with output allowing the elevator call button to be activated. A validated card read will be required for activation.

11. Full and seamless integration of the site intrusion alarm service if applicable, with the installed site access control system software.
12. Final connections to fire alarm system, if required, by electrical and fire alarm system contractors.
13. Provide permits, submittals and approvals required by the authority having jurisdiction, prior to commencing with work.
14. Provide manufacturer required power controllers, interface boards, and programming that may be required for approved electric latch retraction exit devices supplied under Division 08 Section "Door Hardware."
15. Electrical contractor (Division 26) to provide the following:

    a. Provide required conduit, stub-in, junction and back boxes for both the electrified locking hardware and access control equipment at each of the access controlled or monitored openings per plan drawings and specs. Supply and install conduit between each of the aforementioned devices and between the electrical junction boxes, power supplies and access control equipment located on or above the door opening.

        1) At off-line remote readers, provide conduit on the secured side of the door, 36" from the finish floor and 6" from the edge of the frame, to the related power supplies and access control equipment.
        2) At electrified hardware power transfers provide conduit on the secured side of the opening from the power transfer, thru-wire hinge, or serviceable panel location on the frame jamb to the related power supplies and access control equipment.

    b. Electrical Contractor to provide all 120VAC cabling connections and terminations from the electrical junction boxes to these electrical devices.

16. Access Control System Supplier to provide the following:

    a. Low voltage wiring (12/24VDC) for the electrified locking hardware, remote card readers, monitoring and signaling switches, and power supplies. Work includes related connectors, final terminations and hook-ups required for a complete and functional access-controlled opening in accordance with applicable codes and specified system operational narratives.

17. Typical System Requirements (Owner Provided): Central server host computer, client workstations, and hardware peripherals to be from an approved, major line computer manufacturer. Specific information detailing compliance with system requirements to be included in the project submittal package as specified.

PART 2 - PRODUCTS

2.1 INTEGRATED WIRED OUTPUT ACCESS CONTROL, MULTI-CLASS READER

A. Integrated Wired Output Multi-Class Mortise Locks: Wiegand or Open Supervised Device Protocol (OSDP) output ANSI A156.13, Grade 1, mortise lockset with integrated card reader with or without keypad option, request-to-exit signaling, door position status switch, and latchbolt monitoring in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle trim, 3/4" deadlocking anti-friction latch, and 1" case-hardened steel deadbolt. Lock is U.L listed and labeled for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.

1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand or OSDP compatible access control systems. Latchbolt monitoring and door position switch act in conjunction to report door-in-frame (DPS) and door latched (door closed and latched) conditions.
2. Integrated reader supports the following credentials:
    a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
    b. 13.56 MHz proximity credentials: HID Secure Identity Object™ (SIO) on iCLASS Seos, HID iCLASS, HID iCLASS SE/SR, MIFARE Classic, DESFire EV1 and EV2.
    c. 2.4 GHz credentials: Secure Identity Object™ (SIO) on Mobile IDs (Bluetooth Smart)
    d. ISO14443A/B (PIV-compatible Transparent FASC-N read) available with pivCLASS variant.
    e. NFC-enabled mobile phones
    f. PIN code only or PIN + credential with keypad option.
3. 12VDC external power supply required for reader and lock, with optional 24VDC lock solenoid. Fail safe or fail secure options.
4. Energy Efficient Design: Provide lock bodies which have a holding current draw of 500mA maximum and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
5. Support end-of-line resistors contained within the lock case.
6. Installation requires only one cable run from the lock to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
7. Installation to include manufacturer's access control panel interface board or module where required for Wiegand or OSDP output protocol.
8. Manufacturers:
    a. Corbin Russwin (RU) - ML2000 SN Series.
    b. Sargent Manufacturing (SA) - SN200/SN210 8200 Series.

B. Integrated Wired Output Multi-Class Exit Hardware: Wiegand output ANSI 156.3 Grade 1 rim, mortise, and vertical rod exit device hardware with integrated card reader with or without keypad option, latchbolt and touchbar monitoring, and request-to-exit signaling, in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle exit trim with 3/4" throw latch bolt. U.L listed and labeled for either panic or "fire exit hardware" for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.

1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand or OSDP compatible access control systems. Inside push bar (request-to-exit) signaling and door position (open/closed status) monitoring (via separately connected DPS).

2. Integrated reader supports the following credentials:

    a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
    b. 13.56 MHz proximity credentials: HID Secure Identity Object™ (SIO) on iCLASS Seos, HID iCLASS, HID iCLASS SE/SR, MIFARE Classic, DESFire EV1 and EV2.
    c. 2.4 GHz credentials: Secure Identity Object™ (SIO) on Mobile IDs (Bluetooth Smart)
    d. ISO14443A/B (PIV-compatible Transparent FASC-N read) available with pivCLASS variant
    e. NFC-enabled mobile phones
    f. PIN code only or PIN + credential with keypad option

3. 12VDC external power supply required for reader. 24VDC required for solenoid operated exit trim. Fail safe or fail secure options.
4. Installation requires only one cable run from the exit hardware to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
5. Competitor Alternates Allowed Option: Installation to include manufacturer's access control panel interface board or module where required for Wiegand or OSDP output protocol.

6. Manufacturers:

    a. Corbin Russwin (RU) - ED5000 SN Series.
    b. Sargent Manufacturing (SA) - SN200/SN210 80 Series.

2.2 POWER SUPPLIES

A. Intelligent Switching Power Supplies: Provide the least number of power supplies at the appropriate amperage level sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Power supplies shall meet all functions and features as specified herein.

    a. UL listed dual voltage 12 or 24 VDC field selectable continuous output.
    b. Dedicated fast charger to prolong battery life with low battery cutoff to protect batteries from deep discharge.
    c. Enhanced surge immunity for input/output protection
    d. Separate, dedicated battery charging circuit to keep locks cooler.
    e. Dual-color LED visual notification to prevent applying incorrect voltages to the power supply.
    f. Instant auto-switch to battery on AC loss.
    g. Expandable up to 16 outputs in the standard enclosure
    h. Integrated fire alarm interface to allow main output shutdown or disconnect on a per output basis when using an R8 output module.
    i. Network ready and remotely manage locks and connected devices when using an M8 managed output module on network models.
    j. Lifetime replacement, no-fault, no questions asked warranty.

2. Manufacturers:

    a. Securitron (SU) - AQL Series.

2.3 CABLES AND WIRING

A. Comply with Division 27 Section "Conductors and Cables for Electronic Safety and Security."

B. Data Line Supervision: System to include alarm initiation capability in response to opening, closing, shorting, or grounding of data transmission lines.

C. Install appropriate number of conductor pairs, in the wire gage (AWG) recommended by manufacturer, corresponding to the electronic locking functions specified, amperage drawn and distances covered between the power supplies, power transfer devices, electrified hardware and access control equipment.

2.4 ACCESS CONTROL HARDWARE FINISHES

A. Standard: Comply with BHMA A156.18.

B. Protect mechanical finishes on exposed surfaces from damage by applying temporary protective coverings before shipping.

C. Where specified, finishes on integrated card key locksets or exit hardware to incorporate an FDA recognized antimicrobial coating (i.e., MicroShield™) listed for use on equipment as a suppressant to the growth and spread of a broad range of bacteria, algae, fungus, mold and mildew.

D. BHMA Designations: Comply with base material and finish as specified.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance of the installed access control system.

B. Examine roughing-in for electrical source power to verify actual locations of wiring connections before electrified and integrated access control door hardware installation.

C. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

D. Notify architect of any discrepancies or conflicts between the specifications, drawings and scheduled access controlled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Doors and frames at scheduled access controlled openings to be properly prepared to receive specified electrified and access control hardware and connections without additional in-field modifications.

3.3 INSTALLATION

A. Install each item of electronic integrated door hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

B. Mounting Heights: Mount electronic integrated door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."

C. Boxed Power Supplies: Verify locations.

1. Configuration: Provide the least number of power supplies required to adequately serve doors with access control hardware and equipment.

D. Final connect the system control switches (integrated card key locking hardware, remote readers, keypads, display terminals, biometrics), and monitoring, and signaling equipment to the related Controller devices at each opening to properly operate the electrified door and access control hardware according to system operational narratives.

E. Retrofitting: Install each door hardware and access control item to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

F. System Application Software: Install, and test application(s) software and databases for the complete and proper operation of systems involved. Assign software license(s) to Owner.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

B. Commissioning and Testing Schedule: Prior to final acceptance of the access control system installation, the following testing and documentation to be performed and provided to the Owner.

1. Inspection: Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.
2. Pre-testing: Program and adjust the system and pretest all components, wiring, and functions to verify they conform to specified requirements. Provide testing reports indicating devices tested, pass/fail status, and actions taken to resolve problem(s) on failed tests.
3. Acceptance Test Schedule: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
4. Provide “as designed” drawings showing each device and wiring connection and electronic enclosure legends indicating cabling in and out.
5. Provide a complete set of operating instructions for access control hardware devices and a complete software user manual. The documentation includes module reference guides for each electronic enclosure.

3.5 ADJUSTING

A. Adjust and check each operating item of integrated access control door hardware, and each door opening to ensure proper secured operation and function of every unit. Replace units that cannot be adjusted to operate as intended.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by access control system installation.

B. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure access control door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Engage an authorized systems manufacturer representative to train Owner's maintenance personnel to adjust, operate, and maintain electronic integrated door hardware and the access control system.

3.8 ACCESS CONTROL HARDWARE SETS

A. The access control system hardware sets listed below represent the design intent and direction of the owner, architect, and security consultant (as applicable). They are intended as a guideline only and should not be considered a detailed opening schedule. Discrepancies, conflicting, and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.

C. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION

SECTION 28 31 00
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Transmitters for communication with supervising station.

C. Circuits from protected premises to supervising station, including conduit.

D. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.

E. Maintenance of fire alarm system under contract for specified warranty period.

1.02 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

E. NFPA 101 - Life Safety Code; 2015.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements and Section 01 33 00 - Submittal Procedures, for submittal procedures.

B. Proposal Documents: Submit the following with cost/time proposal:
   1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
   3. Certification by Contractor that the system design will comply with the contract documents.
   4. Proposed maintenance contract.

C. Drawings must be prepared using AutoCAD Release 11_.
   1. Owner will provide floor plan drawings for Contractor's use; verify all dimensions on Owner-provided drawings.

D. Evidence of designer qualifications.

E. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
   1. Copy (if any) of list of data required by authority having jurisdiction.
   2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
   4. System zone boundaries and interfaces to fire safety systems.
   5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
   6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
   7. List of all devices on each signaling line circuit, with spare capacity indicated.
   8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.

9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
10. Detailed drawing of graphic annunciator(s).
11. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
12. Certification by the manufacturer of the control unit that the system design complies with the contract documents.
13. Certification by Contractor that the system design complies with the contract documents.

F. Evidence of installer qualifications.

G. Evidence of instructor qualifications; training lesson plan outline.

H. Evidence of maintenance contractor qualifications, if different from installer.

I. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
2. Submit documentation of satisfactory inspections and tests.
3. Submit NFPA 72 "Inspection and Test Form," filled out.

J. Operating and Maintenance Data: See Section 01 78 00 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
4. List of recommended spare parts, tools, and instruments for testing.
5. Replacement parts list with current prices, and source of supply.
6. Detailed troubleshooting guide and large scale input/output matrix.
7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

K. Project Record Documents: See Section 01 78 00 for additional requirements; have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
2. "As installed" wiring and schematic diagrams, with final terminal identifications.
3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

L. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with his installation requirements, is complete, and is in satisfactory operating condition.
2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
3. Certificate of Occupancy.
4. Maintenance contract.

M. Maintenance Materials, Tools, and Software: Furnish the following for Owner's use in maintenance of project.
1. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and place in spare parts cabinet.
2. In addition to the items in quantities indicated in PART 2, furnish the following:
   a. All tools, software, and documentation necessary to modify the fire alarm system using Owner's personnel; minimum modification capability to include addition and

deletion of devices, circuits, and zones, and changes to system description, operation, and evacuation and instructional messages.

b. One copy, on CD-ROM, of all software not resident in read-only-memory.

1.04 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

B. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

C. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.

C. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Alarm Control Units - Basis of Design: FIRE LITE .

B. Fire Alarm Control Units - Other Acceptable Manufacturers: Provided their products meet or exceed the performance of the basis of design product, products of the following are acceptable:
   1. Honeywell Security & Fire Solutions/Fire-Lite: www.firelite.com/#sle.
   2. Honeywell Security & Fire Solutions/Silent Knight: www.silentknight.com/#sle.
   3. Simplex, a Tyco Business: www.simplex-fire.com/#sle.
   4. Provide all control units made by the same manufacturer.

C. Initiating Devices, and Notification Appliances:
   1. Honeywell Security & Fire Solutions/Fire-Lite: www.firelite.com/#sle.
   2. Honeywell Security & Fire Solutions/Silent Knight: www.silentknight.com/#sle.
   3. Simplex, a Tyco Business: www.simplex-fire.com/#sle.
   4. Same manufacturer as control units.
   5. Provide all initiating devices and notification appliances made by the same manufacturer.

D. Substitutions: See Section 01 60 00 - Product Requirements.
   1. For other acceptable manufacturers of control units specified, submit product data showing equivalent features and compliance with contract documents.
   2. For substitution of products by manufacturers not listed, submit product data showing features and certification by Contractor that the design will comply with contract documents.

2.02 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide a new FIRELITE automatic fire detection and alarm system:
   1. Provide all components necessary, regardless of whether shown in the contract documents or not.
   2. Protected Premises: Entire building shown on drawings.
   3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:

a. ADA Standards for Accessible Design.
b. The requirements of the State Fire Marshal.
c. The requirements of the local authority having jurisdiction, which is State Of Delaware Fire Marshall's office.
d. Applicable local codes.
e. The contract documents (drawings and specifications).
f. NFPA 101.
g. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.

4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
5. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
6. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
7. Program notification zones and voice messages as directed by Owner.
8. Hearing Impaired Occupants: Provide visible notification devices in all public areas and in dwelling units.
9. Fire Command Center: Location indicated on drawings.
10. Master Control Unit (Panel): New, located at fire command center.

B. Supervising Stations and Fire Department Connections:
1. Public Fire Department Notification: By on-premises supervising station.
2. On-Premises Supervising Station: None.
3. Means of Transmission to Remote Supervising Station: Digital alarm communicator transmitter (DACT), 2 telephone lines.

C. Circuits:
1. Initiating Device Circuits (IDC): Class A, Style D.
2. Signaling Line Circuits (SLC) Within Single Building: Class A, Style 7.
3. Notification Appliance Circuits (NAC): Class A, Style Z.

D. Spare Capacity:
1. Initiating Device Circuits: Minimum 25 percent spare capacity.
2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
3. Speaker Amplifiers: Minimum 25 percent spare capacity.
4. Master Control Unit: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

E. Power Sources:
1. Primary: Dedicated branch circuits of the facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
4. Each Computer System: Provide uninterruptible power supply (UPS).

2.03 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
1. Sprinkler water control valves.
2. Dry-pipe sprinkler system pressure.
3. Dry-pipe sprinkler valve room low temperature.
4. Sprinkler water storage tank low level.
5. Sprinkler water storage tank low temperature.
6. Fire pump(s).
7. Elevator shut-down control circuits.

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:

1. Sprinkler water flow.
2. Kitchen hood suppression activation; also disconnect fuel source from cooking equipment.
3. Elevator lobby, elevator hoistway, and elevator machine room smoke detectors.
4. Duct smoke detectors.

C. Doors:
1. Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor. Refer to Section 08 71 00.
2. Electromagnetic Door Locks on Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from. Refer to Section 08 71 00.

2.04 COMPONENTS

A. General:
1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units, Initiating Devices, and Notification Appliances: Analog, addressable type; listed by Underwriters Laboratories as suitable for the purpose intended.

C. Addressable Fire Alarm Control Unit - Basis of Design: Fire- Lite.

D. Master Control Unit: As specified for Basis of Design above, or equivalent.

E. Remote Annunciators: Fire Lite.

F. Initiating Devices:
1. Addressable Systems:
a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.
2. Manual Pull Stations: Fire Lite.
a. Provide 1 extra.
3. Key Operated Pull Stations: Fire Lite.
4. Smoke Detectors: Fire Lite.
a. Provide 5 extra.
5. Duct Smoke Detectors: Fire Lite.
6. Heat Detectors: Fire Lite.
a. Provide 2 extra.
7. Addressable Interface Devices: Fire Lite.
a. Provide 1 extra.

G. Notification Appliances:
1. Bells: Fire Lite.
2. Speakers / horns: FireLite.
3. Strobes: Fire Lite.
a. Provide 1 extra.
4. Speaker strobes / horn strobes: Firelite.
a. Provide 5 extra.

H. Circuit Conductors: Copper or optical fiber; provide 200 feet extra; color code and label.

I. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
1. Equipment Connected to Alternating Current Circuits: Maximum let through voltage of 350 V(ac), line-to-neutral, and 350 V(ac), line-to-line; do not use fuses.

2. Initiating Device Circuits, Notification Appliance Circuits, and Communications Circuits: Provide surge protection at each point where circuit exits or enters a building; rated to protect applicable equipment; for 24 V(dc) maximum dc clamping voltage of 36 V(dc), line-to-ground, and 72 V(dc), line-to-line.
3. Signaling Line Circuits: Provide surge protection at each point where circuit exits or enters a building, rated to protect applicable equipment.

J. Locks and Keys: Deliver keys to Owner.
1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type

K. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
2. Provide one for each control unit where operations are to be performed.
3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and the contract documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Obtain Owner's approval of locations of devices, before installation.

D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 7 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

H. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.
1. Record all system operations and malfunctions.
2. If a malfunction occurs, start diagnostic period over after correction of malfunction.
3. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
4. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

3.03 OWNER PERSONNEL INSTRUCTION

A. Provide the following instruction to designated Owner personnel:
1. Hands-On Instruction: On-site, using operational system.
2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.

B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:

1. Initial Training: 1 session pre-closeout.

C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
   1. Initial Training: 1 session pre-closeout.

D. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

3.04 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
   1. Be prepared to conduct any of the required tests.
   2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
   3. Have authorized technical representative of control unit manufacturer present during demonstration.
   4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
   5. Repeat demonstration until successful.

B. Occupancy of the project will not occur prior to Substantial Completion.

C. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
   1. Specified diagnostic period without malfunction has been completed.
   2. Approved operating and maintenance data has been delivered.
   3. Spare parts, extra materials, and tools have been delivered.
   4. All aspects of operation have been demonstrated to Owner.
   5. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
   6. Occupancy permit has been granted.
   7. Specified pre-closeout instruction is complete.

3.05 MAINTENANCE

A. See Section 01 70 00 - Execution Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner, at no extra cost, a written maintenance contract for entire manufacturer's warranty period, to include the work described below.

C. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
   1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
   2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
   3. Record keeping required by NFPA 72 and authorities having jurisdiction.

D. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 2 hours of notification.
   2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

E. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

F. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts

replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

G. Comply with Owner's requirements for access to facility and security.

END OF SECTION

SECTION 31 20 00
EARTH MOVING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Excavating and filling for rough grading the Site.
   2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
   3. Excavating and backfilling for buildings and structures.
   4. Drainage course for concrete slabs-on-grade.
   5. Subbase course for concrete walks and pavements.
   6. Subbase course and base course for asphalt paving.
   7. Subsurface drainage backfill for walls and trenches.
   8. Excavating and backfilling trenches for utilities and pits for buried utility structures.
   9. Excavating well hole to accommodate elevator-cylinder assembly.

B. Related Requirements:
   1. Section 01 32 00 "Construction Progress Documentation" for recording pre-excavation and earth-moving progress.
   2. Civil Drawings for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
   3. Section 32 93 00 "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.

1.03 UNIT PRICES

A. Work of this Section is affected by unit prices for earth moving specified in Section 01 22 00 "Unit Prices."

B. Quantity allowances for earth moving are included in Section 01 21 00 "Allowances."

C. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following. Unit prices for rock excavation include replacement with approved materials.
   1. 24 inches outside of concrete forms other than at footings.
   2. 12 inches outside of concrete forms at footings.
   3. 6 inches outside of minimum required dimensions of concrete cast against grade.
   4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
   5. 6 inches beneath bottom of concrete slabs-on-grade.
   6. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

1.04 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
   1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
   2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
   3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation and exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D1586. Rock material that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
   1. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- maximum-width, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom.
   2. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

L. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.05 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct pre-excavation conference at Project site.
   1. Review methods and procedures related to earthmoving, including, but not limited to, the following:
      a. Personnel and equipment needed to make progress and avoid delays.
      b. Coordination of Work with utility locator service.
      c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
      d. Extent of trenching by hand or with air spade.
      e. Field quality control.

1.06 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:
   1. Geotextiles.
   2. Warning tapes.

B. Samples for Verification: For the following products, in sizes indicated below:
   1. Geotextile: 12 by 12 inches.

2. Warning Tape: 12 inches long; of each color.

1.07 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
   1. Classification according to ASTM D2487.
   2. Laboratory compaction curve according to ASTM D698.

C. Pre-excavation Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.08 PROJECT CONDITIONS

A. A. Subsurface Conditions: Subsurface soils investigations have been made at the site. The report and logs of the test borings and test pits are included in the Appendix of these specifications. Such investigations have been made for the purposes of design only and neither the Engineers, the Owner, nor the Geotechnical Engineer guarantee adequacy or accuracy of the data, or that data are representative of all conditions to be encountered. Such information is made available for general information only and shall not relieve the Contractor of the responsibility for making his own investigations, tests, and analysis. Any additional test borings and other exploratory operations may be made by Contractor shall be at no cost to Owner.
   1. See Geotechnical Engineering Report prepared by Duffield, Inc. in Division 1 for test boring data and other requirements.

1.09 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.

1.10 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without fifteen days of advanced notice and written permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
   1. Do not proceed with work on adjoining property until directed by Engineer. This includes any disruption to common sidewalk and drive aisle areas. Authorization will not be unreasonably withheld.

C. Utility Locator Service: Notify "Miss Utility" Delaware for area where Project is located before beginning earth-moving operations.

D. Do not commence earth-moving operations until erosion- and sedimentation-control measures specified on the Civil Drawings are in place.

E. Do not commence earth-moving operations until plant-protection measures specified in Section 01 56 39 "Temporary Tree and Plant Protection" are in place.

F. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundments of water.
   6. Excavation or other digging unless otherwise indicated.

7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

I. Do not allow contractor vehicles or equipment to be stored or parked on adjacent property or common areas without the express written consent of the Owner.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, SW, SP, and SM according to ASTM D2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Soil Classification Groups SM, ML, and CL can be used with approval from owner's testing and inspection agency if they do not contain organics.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487, or a combination of these groups.
1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.

J. Sand: ASTM C33; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.02 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:
   a. Grab Tensile Strength: 157 lbf; ASTM D4632.
   b. Sewn Seam Strength: 142 lbf; ASTM D4632.
   c. Tear Strength: 56 lbf; ASTM D4533.
   d. Puncture Strength: 56 lbf; ASTM D4833.

3. Apparent Opening Size: No. 40 sieve, maximum; ASTM D4751.
4. Permittivity: 0.5 per second, minimum; ASTM D4491.
5. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:
   a. Grab Tensile Strength: 247 lbf; ASTM D4632.
   b. Sewn Seam Strength: 222 lbf; ASTM D4632.
   c. Tear Strength: 90 lbf; ASTM D4533.
   d. Puncture Strength: 90 lbf; ASTM D4833.
3. Apparent Opening Size: No. 60 sieve, maximum; ASTM D4751.
4. Permittivity: 0.02 per second, minimum; ASTM D4491.
5. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.

2.03 ACCESSORIES

A. Warning Tape (For metallic pipe): Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

B. Detectable Warning Tape (For non-metallic pipe): Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.02 DEWATERING

A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

E. Dewatering operations must comply with the DNREC Sediment and Stormwater Regulations as amended.

3.03 EXPLOSIVES

A. Explosives: Do not use explosives.

3.04 EXCAVATION, GENERAL

A. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Engineer. The Contract Sum will be adjusted for unsuitable soils and/or rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for additional excavation and replacement.
   1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.
      a. Intermittent drilling; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
   2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
      a. 24 inches outside of concrete forms other than at footings.
      b. 12 inches outside of concrete forms at footings.
      c. 6 inches outside of minimum required dimensions of concrete cast against grade.
      d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
      e. 6 inches beneath bottom of concrete slabs-on-grade.
      f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

3.05 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
   1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
   2. Excavation for Underground Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:
   1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
   2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.06 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.07 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.
   1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
   1. Clearance: 12 inches each side of pipe or conduit or as indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade. Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
   1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
   2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
   3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
   4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:
   1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
   2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
   3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.08 SUBGRADE INSPECTION

A. Notify Engineer when excavations have reached required subgrade.

B. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
   1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
   2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.09 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Engineer.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Engineer.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover or employ temporary stabilization in accordance with Sediment and Stomrwater Plans to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
   1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
   2. Surveying locations of underground utilities for Record Documents.
   3. Testing and inspecting underground utilities.
   4. Removing concrete formwork.
   5. Removing trash and debris.
   6. Removing temporary shoring, bracing, and sheeting.
   7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 3 Section "Cast-in-Place Concrete."

D. Trenches under Roadways: Provide 4-inch thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Division 3 Section "Cast-in-Place Concrete."

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Initial Backfill:
   1. Soil Backfill: Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
      a. Carefully compact initial backfill under pipe haunches and compact evenly upon both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

G. Final Backfill:
   1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.

H. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use satisfactory soil material.
   2. Under walks and pavements, use satisfactory soil material.
   3. Under steps and ramps, use engineered fill.
   4. Under building slabs, use engineered fill.

5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
   1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D698:
   1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
   2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
   3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
   4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
   1. Turf or Unpaved Areas: Plus or minus 1 inch.
   2. Walks: Plus or minus 1 inch.
   3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.17 SUBSURFACE DRAINAGE

A. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
   1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D698 with a minimum of two passes of a plate-type vibratory compactor.

B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D698 with a minimum of two passes of a plate-type vibratory compactor.
2. Place and compact impervious fill over drainage backfill in 6-inch-thick compacted layers to final subgrade.

3.18 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
   1. Place base course material over subbase course under hot-mix asphalt pavement.
   2. Shape subbase course and base course to required crown elevations and cross-slope grades.
   3. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
   4. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (thick or less than 3 inches thick.
   5. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D698.

C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D698.

3.19 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
   1. Place drainage course in lifts not to exceed 6 inches.
   2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D698.

3.20 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
   2. Determine that fill material classification and maximum lift thickness comply with requirements.
   3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.

D. Testing agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2937, and ASTM D6938, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.21 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

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SECTION 31 31 16
TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Chemical soil treatment.

1.02 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.

B. Soil Treatment: By the square yard of treated soil. Includes applying toxicant to designated soil, re-treating when directed, warranty, annual inspections.

1.03 REFERENCE STANDARDS

A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; 2006.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.

C. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements.

D. Manufacturer's Instructions: Indicate caution requirement.

E. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing this type of work and:
   1. Having minimum of three (3) years documented experience.
   2. Approved by manufacturer of treatment materials.
   3. Licensed in the State in which the Project is located.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work consisting of applied soil termiticide treatment will prevent infestation of subterranean termites, including Formosan termites (Coptotermes formosanus). If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
   1. Warranty Period: Three years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MATERIALS

2.02 CHEMICAL SOIL TREATMENT

A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.

B. Diluent: Recommended by toxicant manufacturer.

C. Service Life of Treatment: Soil treatment termiticide that is effective for not less than three years against infestation of subterranean termites.

D. Manufacturers:
   1. Bayer Environmental Science Corp: www.backedbybayer.com/pest-management/#sle.
   2. FMC Professional Solutions: www.fmcprosolutions.com/#sle.
   3. Syngenta Professional Products: www.syngentaprofessionalproducts.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.

B. Verify final grading is complete.

3.02 APPLICATION

A. Comply with manufacturer's written instructions.

3.03 APPLICATION - CHEMICAL TREATMENT

A. Comply with requirements of U.S. EPA and applicable state and local codes.

B. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.

1. Slabs-on-Grade and Basement Slabs: Underground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
2. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, and piers; and along the entire outside perimeter, from grade to bottom of footing.
3. Masonry: Treat voids.
4. Penetrations: At expansion joints, control joints, and areas where slabs and below-grade walls will be penetrated.

C. Post warning signs in areas of application.

D. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION

SECTION 32 12 16
ASPHALT PAVING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Hot-mix asphalt paving.
   2. Hot-mix asphalt overlay.
   3. Cold milling of existing asphalt pavement.
   4. Hot-mix asphalt patching.
   5. Asphalt surface treatments.

B. Related Requirements:
   1. Section 02 41 19 "Selective Demolition" for demolition and removal of existing asphalt pavement.
   2. Section 31 20 00 "Earth Moving" for subgrade preparation, fill material, separation geotextiles, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
   3. Section 32 13 13 "Concrete Paving" for concrete pavement and for separate concrete curbs, gutters, and driveway aprons.
   4. Section 32 14 00 "Unit Paving" for bituminous setting bed for pavers and for stone and precast concrete curbs.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at the Project site.
   1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
      a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
      b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

1.04 ACTION SUBMITTALS

A. Product Data: Include technical data and tested physical and performance properties.
   1. Herbicide.
   2. Paving geotextile.
   3. Joint sealant.

B. Hot-Mix Asphalt Designs:
   1. Certification, by authorities having jurisdiction, of approval of each hot-mix asphalt design proposed for the Work.
   2. For each hot-mix asphalt design proposed for the Work.

C. Samples for Verification: For the following product, in manufacturer's standard sizes unless otherwise indicated:
   1. Paving Geotextile: 12 by 12 inches minimum.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For paving-mix manufacturer.

B. Material Certificates:
   1. Aggregates.
   2. Asphalt binder.
   3. Asphalt cement.

4. Cutback prime coat.
5. Emulsified asphalt prime coat.
6. Tack coat.
7. Fog seal.
8. Undersealing asphalt.

C. Field quality-control reports.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Pavement mix shall come from an approved Delaware Department of Transportation plant. Evidence of Delaware Department of Transportation testing and approval shall be provided prior to scheduling hot mix installation.

B. Testing Agency Qualifications: Qualified in accordance with ASTM D3666 for testing indicated.

C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the Delaware Department of Transportation for asphalt paving work.
1. Measurement and payment provisions and safety program submittals included in the Delaware Department of Transportation Standards and Specifications do not apply to this Section.

1.07 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
1. Prime Coat: Minimum surface temperature of 60 deg F.
2. Tack Coat: Minimum surface temperature of 60 deg F.
3. Slurry Coat: Comply with weather limitations in ASTM D3910.
4. Asphalt Base Course and Binder Course: Minimum surface temperature of 45 deg F and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 PRODUCTS

2.01 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D692/D692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.02 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO M 332 binder designation PG 64-22.

B. Asphalt Cement: ASTM D3381/D3381M for viscosity-graded material.

C. Cutback Prime Coat: ASTM D2027/D2027M, medium-curing cutback asphalt, MC-70.

D. Emulsified Asphalt Prime Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

E. Tack Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

F. Fog Seal: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

G. Water: Potable.

H. Undersealing Asphalt: ASTM D3141/D3141M; pumping consistency.

2.03 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by the EPA, and not classified as "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable powder form.

B. Sand: AASHTO M 29, Grade No. 2 or No. 3.

C. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.

D. Joint Sealant: ASTM D3405 as modified by MSMT 404.

2.04 MIXES

A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by the Delaware Department of Transportation and complying with the following requirements:

B. Provide mixes with a history of satisfactory performance in geographical area where Project is located.

C. Base Course: 8” Graded Aggregate Base Course.

D. Binder Course: 2.5” Superpave Asphalt Mix, 19.0mm, PG 64S-22, Level 2.

E. Surface Course: 1.5" Superpave Asphalt Mix, 9.5mm, PG 64S-22, Level 2.

F. Emulsified-Asphalt Slurry: M140 or M208.

PART 2 - EXECUTION

3.01 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protection: Provide protective materials, procedures, and worker training to prevent asphalt materials from spilling, coating, or building up on curbs, driveway aprons, manholes, and other surfaces adjacent to the Work.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
   1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
   2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
   3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer and replace with compacted backfill or fill as directed.

3.03 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
   1. Mill to a depth of 1-1/2 inches.
   2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
   3. Control rate of milling to prevent tearing of existing asphalt course.
   4. Repair or replace curbs, driveway aprons, manholes, and other construction damaged during cold milling.
   5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
   6. Patch surface depressions deeper than 1 inch after milling, before wearing course is laid.
   7. Handle milled asphalt material in accordance with approved waste management plan.
   8. Keep milled pavement surface free of loose material and dust.
   9. Do not allow milled materials to accumulate on-site.

3.04 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd..
   1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

C. Placing Single-Course Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

D. Placing Two-Course Patch Material: Partially fill excavated pavements with hot-mix asphalt base course mix and, while still hot, compact. Cover asphalt base course with compacted layer of hot-mix asphalt surface course, finished flush with adjacent surfaces.

3.05 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
   1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.
   1. Clean cracks and joints in existing hot-mix asphalt pavement.
   2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
   3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.06 SURFACE PREPARATION

A. Ensure that prepared subgrade has been proof-rolled and is ready to receive paving. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces.

B. Herbicide Treatment: Apply herbicide in accordance with manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
   1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.

C. Cutback Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd.. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.
   1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
   2. Protect primed substrate from damage until ready to receive paving.

D. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 to 0.30 gal./sq. yd. per inch depth. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.
   1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
   2. Protect primed substrate from damage until ready to receive paving.

E. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
   1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.07 INSTALLATION OF PAVING GEOTEXTILE

A. Apply tack coat uniformly to existing pavement surfaces at a rate of 0.20 to 0.30 gal./sq. yd..

B. Place paving geotextile promptly in accordance with manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches and transverse joints 6 inches.

C. Protect paving geotextile from traffic and other damage, and place hot-mix asphalt overlay the same day.

3.08 HOT-MIX ASPHALT PLACEMENT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
   1. Place hot-mix asphalt base course and binder course in number of lifts and thicknesses indicated.
   2. Place hot-mix asphalt surface course in single lift.
   3. Spread mix at a minimum temperature of 250 deg F.
   4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
   5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
   1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to ensure proper compaction of mix along longitudinal joints.
   2. Complete a section of asphalt base course and binder course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.09 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
   1. Clean contact surfaces and apply tack coat to joints.
   2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
   3. Offset transverse joints, in successive courses, a minimum of 24 inches.
   4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method in accordance with AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
   5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
   6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.10 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
   1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
   1. Average Density, Marshall Test Method: 96 percent of reference laboratory density in accordance with AASHTO T 245, but not less than 94 percent or greater than 100 percent.
   2. Average Density, Rice Test Method: 92 percent of reference maximum theoretical density in accordance with ASTM D2041/D2041M, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.11 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce thickness indicated within the following tolerances:
   1. Base Course and Binder Course: Plus or minus 1/2 inch.
   2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
   1. Base Course and Binder Course: 1/4 inch.
   2. Surface Course: 1/8 inch.
   3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.12 SURFACE TREATMENTS

A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.

B. Slurry Seals: Apply slurry coat in a uniform thickness in accordance with ASTM D3910 and allow to cure.
   1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined in accordance with ASTM D3549/D3549M.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement in accordance with AASHTO T 168.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared in accordance with ASTM D2041/D2041M, and compacted in accordance with job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples in accordance with ASTM D1188 or ASTM D2726/D2726M.
    a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than three cores taken.
    b. Field density of in-place compacted pavement may also be determined by nuclear method in accordance with ASTM D2950/D2950M and coordinated with ASTM D1188 or ASTM D2726/D2726M.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.14 WASTE HANDLING

A. General: Handle asphalt-paving waste in accordance with approved waste management plan.

END OF SECTION

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SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes Concrete Paving Including the Following:
   1. Loading Dock.
   2. Curbs and gutters.
   3. Walks.
   4. Base under unit pavers.

B. Related Requirements:
   1. Section 03 30 00 "Cast-in-Place Concrete" for general building applications of concrete.
   2. Section 32 13 73 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.
   3. Section 32 17 23 "Pavement Markings."
   4. Section 32 17 26 "Tactile Warning Surfacing" for cast-in-place detectable warning surfacing.

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at project site.
   1. Review methods and procedures related to concrete paving, including but not limited to, the following:
      a. Concrete mixture design.
      b. Quality control of concrete materials and concrete paving construction practices.
   2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Concrete paving Subcontractor.
      d. Civil Engineer.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.

C. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.06 INFORMATIONAL SUBMITTALS

A. Material Certificates: For the following, from manufacturer:
   1. Cementitious materials.
   2. Steel reinforcement and reinforcement accessories.
   3. Fiber reinforcement.
   4. Admixtures.

5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

B. Material Test Reports: For each of the following:
   1. Aggregates

C. Field quality-control reports.

1.07 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products that complies with ASTM C94 requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

B. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
   2. Build mockups of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Engineer and not less than 96 inches by 96 inches. Include full-size detectable warning.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.08 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

1.09 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
   1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
   2. Do not use frozen materials or materials containing ice or snow.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

C. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
   1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2 PRODUCTS

2.01 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

2.02 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

B. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.

C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.03 STEEL REINFORCEMENT

A. Plain-Steel Welded-Wire Reinforcement: ASTM A1064, fabricated from steel wire into flat sheets.

B. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064, flat sheet.

C. Epoxy-Coated Welded-Wire Reinforcement: ASTM A884, Class A, plain steel.

D. Reinforcing Bars: ASTM A615, Grade 60; deformed.

E. Galvanized Reinforcing Bars: ASTM A767, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A615, Grade 60 deformed bars.

F. Epoxy-Coated Reinforcing Bars: ASTM A775 or ASTM A934; with ASTM A615, Grade 60 deformed bars.

G. Steel Bar Mats: ASTM A184; with ASTM A615, Grade 60 deformed bars; assembled with clips.

H. Plain-Steel Wire: ASTM A1064.

I. Deformed-Steel Wire: ASTM A1064.

J. Epoxy-Coated-Steel Wire: ASTM A88, Class A; coated, plain.

K. Joint Dowel Bars: ASTM A61, Grade 60 plain-steel bars zinc coated (galvanized) after fabrication according to ASTM A767, Class I coating. Cut bars true to length with ends square and free of burrs.

L. Epoxy-Coated, Joint Dowel Bars: ASTM A775; with ASTM A615, Grade 60 plain-steel bars.

M. Tie Bars: ASTM A615, Grade 60; deformed.

N. Hook Bolts: ASTM A307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

O. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
   1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
   2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

P. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

Q. Zinc Repair Material: ASTM A780.

2.04 CONCRETE MATERIALS

A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:
   1. Portland Cement: ASTM C150, white portland cement Type I or Type II.
   2. Fly Ash: ASTM C618, Class C or Class F.
   3. Slag Cement: ASTM C989, Grade 100 or 120.
   4. Blended Hydraulic Cement: ASTM C595, Type IS, portland blast-furnace slag cement.

B. Normal-Weight Aggregates: ASTM C33, Class 4S, uniformly graded. Provide aggregates from a single source. Verify availability before specifying.
   1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:
   1. Aggregate Sizes: 3/4 to 1 inch nominal.

D. Air-Entraining Admixture: ASTM C260.

E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
   1. Water-Reducing Admixture: ASTM C494, Type A.
   2. Retarding Admixture: ASTM C494, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C494, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C1017, Type II.

F. Water: Potable and complying with ASTM C94.

2.05 FIBER REINFORCEMENT

A. Synthetic Fiber: Monofilament polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C1116, Type III, 1/2 to 1-1/2 inches long.

B. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C1116, Type III, 1/2 to 1-1/2 inches long.

2.06 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry or cotton mats.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.

F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 2, Class B, dissipating.

2.07 RELATED MATERIALS

A. Joint Fillers: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork in preformed strips.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less

than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

C. Bonding Agent: ASTM C1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy-Bonding Adhesive: ASTM C881, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:
   1. Types I and II, nonload bearing or Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.

2.08 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
   1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
   2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
   1. Fly Ash or Pozzolan: 25 percent.
   2. Slag Cement: 50 percent.
   3. Combined Fly Ash or Pozzolan, and Slag Cement: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
   1. Air Content: 5 to 8 percent plus or minus 1-1/2 percent for 1-1/2-inch nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd.

G. Concrete Mixtures: Normal-weight concrete.
   1. Compressive Strength (28 Days): 4500 psi.
   2. Maximum W/C Ratio at Point of Placement: 0.45.
   3. Slump Limit: 2 to 5 inches.

2.09 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M and ASTM C1116. Furnish batch certificates for each batch discharged and used in the Work.
   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete batches of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete batches larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Section 312000 "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.03 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.04 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D3963.

G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.05 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
   1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
   2. Provide tie bars at sides of paving strips where indicated.
   3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
   4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
   5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
   1. Locate expansion joints at intervals of 50 feet unless otherwise indicated.
   2. Extend joint fillers full width and depth of joint.
   3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
   4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
   5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
   6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes.
      a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
      a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.
   3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes.

3.06 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement dowels and joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.
   1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

3.07 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
   1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
   2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
   3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.08 DETECTABLE WARNING INSTALLATION

A. Cast-in-Place Detectable Warning Tiles: Form blockouts in concrete for installation of tiles specified in Section 321726 "Tactile Warning Surfacing." Screed surface of concrete where tiles are to be installed to elevation, so that edges of installed tiles will be flush with surrounding concrete paving. Embed tiles in fresh concrete to comply with Section 321726 "Tactile Warning Surfacing" immediately after screeding concrete surface.

3.09 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by a combination of these as follows:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.10 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 as follows:
   1. Elevation: 3/4 inch.
   2. Thickness: Plus 3/8 inch, minus 1/4 inch.
   3. Surface: Gap below 10-feet-long; unleveled straightedge not to exceed 1/2 inch.
   4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
   5. Lateral Alignment and Spacing of Dowels: 1 inch.
   6. Vertical Alignment of Dowels: 1/4 inch.
   7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
   8. Joint Spacing: 3 inches.
   9. Contraction Joint Depth: Plus 1/4 inch, no minus.
   10. Joint Width: Plus 1/8 inch, no minus.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:
   1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
      a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   2. Slump: ASTM C143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
   3. Air Content: ASTM C231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   4. Concrete Temperature: ASTM C1064; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C31; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C39; test one specimen at seven days and two specimens at 28 days.
    a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.12 REPAIR AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Engineer.

B. Drill test cores, where directed by Engineer, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 32 13 73
CONCRETE PAVING JOINT SEALANTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Cold-applied joint sealants.
   2. Hot-applied joint sealants.
   3. Cold-applied, fuel-resistant joint sealants.
   4. Hot-applied, fuel-resistant joint sealants.
   5. Joint-sealant backer materials.
   6. Primers.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Paving-Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.
   3. Joint-sealant formulation.
   4. Joint-sealant color.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of joint sealant and accessory.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1.07 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and

application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.02 COLD-APPLIED JOINT SEALANTS

A. Multicomponent, Nonsag, Urethane, Elastomeric Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, for Use T.

B. Single Component, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C920, Type S, Grade P, Class 25, for Use T.

C. Multicomponent, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C920, Type M, Grade P, Class 25, for Use T.

2.03 HOT-APPLIED JOINT SEALANTS

A. Hot-Applied, Single-Component Joint Sealant: ASTM D6690, Type I.

B. Hot-Applied, Single-Component Joint Sealant: ASTM D6690, Type I or Type II.

C. Hot-Applied, Single-Component Joint Sealant: ASTM D6690, Type I, II, or III.

D. Hot-Applied, Single-Component Joint Sealant: ASTM D6690, Type IV.

2.04 COLD-APPLIED, FUEL-RESISTANT JOINT SEALANTS

A. Fuel-Resistant, Single-Component, Pourable, Modified-Urethane, Elastomeric Joint Sealant: ASTM C920, Type S, Grade P, Class 25, for Use T.

B. Fuel-Resistant, Multicomponent, Pourable, Modified-Urethane, Elastomeric Joint Sealant: ASTM C920, Type M, Grade P, Class 12-1/2 or 25, for Use T.

2.05 HOT-APPLIED, FUEL-RESISTANT JOINT SEALANTS

A. Hot-Applied, Fuel-Resistant, Single-Component Joint Sealants: ASTM D7116, Type I or Type II.

B. Hot-Applied, Fuel-Resistant, Single-Component Joint Sealants: ASTM D7116, Type III.

2.06 JOINT-SEALANT BACKER MATERIALS

A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.07 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.03 INSTALLATION OF JOINT SEALANTS

A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions.

C. Install joint-sealant backings to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of joint-sealant backings.
   2. Do not stretch, twist, puncture, or tear joint-sealant backings.
   3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:
   1. Place joint sealants so they fully contact joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
   1. Remove excess joint sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.04 CLEANING AND PROTECTION

A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

B. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

3.05 PAVING-JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Joints within concrete paving.
   1. Joint Location:
      a. Expansion and isolation joints in concrete paving.
      b. Contraction joints in concrete paving.
      c. Other joints as indicated.
   2. Joint Sealant: Multicomponent, nonsag, urethane, elastomeric joint sealant.

3. Joint-Sealant Color: Manufacturer's standard.

B. Joint-Sealant Application: Joints within concrete paving and between concrete and asphalt paving.
   1. Joint Location:
      a. Joints between concrete and asphalt paving.
      b. Joints between concrete curbs and asphalt paving.
      c. Other joints as indicated.
   2. Joint Sealant: Hot-applied, single-component joint sealant.
   3. Joint-Sealant Color: Manufacturer's standard.

C. Joint-Sealant Application: Fuel-resistant joints within concrete paving.
   1. Joint Location:
      a. Expansion and isolation joints in concrete paving.
      b. Contraction joints in concrete paving.
      c. Other joints as indicated.
   2. Joint Sealant: Fuel-resistant, multicomponent, pourable, modified-urethane, elastomeric joint sealant.
   3. Joint-Sealant Color: Manufacturer's standard.

END OF SECTION

SECTION 32 17 23
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Delaware Manual on Uniform Traffic Control Devices (MUTCD).

1.02 SUMMARY

A. Section Includes:
   1. Painted and thermoplastic markings applied to asphalt paving.
   2. Painted markings applied to concrete surfaces.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to marking asphalt paving or concrete surfaces including, but not limited to, the following:
      a. Asphalt-paving or concrete-surface aging period before application of pavement markings.
      b. Review requirements for protecting pavement markings, including restriction of traffic during installation period.

1.04 ACTION SUBMITTALS

A. Product Data: Include technical data and tested physical and performance properties.
   1. Pavement-marking paint, alkyd.
   2. Pavement-marking paint, latex.
   3. Thermoplastic pavement-marking.

B. Shop Drawings:
   1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
   2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

C. Samples: For each exposed product and for each color and texture specified; on rigid backing, 8 inches square.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the Delaware Department of Transportation for pavement-marking work.
   1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.06 FIELD CONDITIONS

A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for alkyd materials and 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain pavement-marking paints from single source from single manufacturer.

2.02 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and the most recent accessibility guidelines of the Americans with Disabilities Act (ADA).

2.03 PAVEMENT-MARKING PAINT

A. Pavement-Marking Paint, Alkyd: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type N or Type S; colors complying with FS TT-P-1952F.
   1. Color: White, Yellow, Blue, or Green as indicated on construction plans.

B. Pavement-Marking Paint, Latex: MPI #97, latex traffic-marking paint.
   1. Color: White, Yellow, Blue, or Green as indicated on construction plans.

C. Thermoplastic Pavement Marking, See Sections 554 and 951.04 of the Delaware Department of Transportation Standards Specifications for Road and Bridge Construction.
   1. Color: White as indicated on construction plans.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that pavement-marking substrate is dry and in suitable condition to begin pavement marking in accordance with manufacturer's written instructions.

B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.02 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow asphalt paving or concrete surfaces to age for a minimum of 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
   1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to asphalt paving or concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
   2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal.

3.03 PROTECTING AND CLEANING

A. Protect pavement markings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 32 17 26
TACTILE WARNING SURFACING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Cast-in-place detectable warning tiles.

B. Related Requirements:
   1. Section 32 13 13 "Concrete Paving" for concrete walkways serving as substrates for tactile warning surfacing.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of exposed finish requiring color selection.

C. Samples for Verification: For each type of tactile warning surface, in manufacturer's standard sizes unless otherwise indicated, showing edge condition, truncated-dome pattern, texture, color, and cross section; with fasteners and anchors.

1.04 CLOSEOUT SUBMITTALS

A. Maintenance Data: For tactile warning surfacing, to include in maintenance manuals.

1.05 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.06 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.07 PROJECT CONDITIONS

A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

B. Weather Limitations for Adhesive Application:
   1. Apply adhesive only when ambient temperature is above 50 deg F and when temperature has not been below 35 deg F for 12 hours immediately before application. Do not apply when substrate is wet or contains excess moisture.

C. Weather Limitations for Mortar and Grout:
   1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
   2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. Provide artificial shade and windbreaks, and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and higher.
      a. When ambient temperature exceeds 100 deg F, or when wind velocity exceeds 8 mph and ambient temperature exceeds 90 deg F, set unit pavers within 1 minute of spreading setting-bed mortar.

1.08 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of tactile warning surfaces that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Deterioration of finishes beyond normal weathering and wear.
    b. Separation or delamination of materials and components.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 TACTILE WARNING SURFACING, GENERAL

A. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for tactile warning surfaces. Ensure detectable warning surfaces are in accordance with the most recent accessibility guidelines of the Americans with Disabilities Act (ADA).
    1. For tactile warning surfaces composed of multiple units, provide units that when installed provide consistent side-to-side and end-to-end dome spacing that complies with requirements.

B. Source Limitations: Obtain each type of tactile warning surfacing joint material, setting material, anchor, and fastener from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.02 DETECTABLE WARNING TILES

A. Cast-in-Place Detectable Warning Tiles: Accessible truncated-dome detectable warning tiles configured for setting flush in new concrete walkway surfaces, with slip-resistant surface treatment on domes and field of tile.
    1. Material: Cast-fiber-reinforced polymer concrete tile
    2. Color: Red brick
    3. Shapes and Sizes:
        a. Rectangular panel, detectable warning surface shall be 24 inches wide in the direction of pedestrian travel and installed for the full width of the curb ramp, walkway, landing, or blended transition. Do not bridge or overhang cracks or expansion joints. See construction plans for varied widths of curb ramps and walkways
        b. Radius panel, nominal 24 inches deep by radius depicted on construction plans.
    4. Dome Spacing and Configuration: 1.67-inch to 2.35-inch, in square pattern. The base of the domes shall be 0.9 to 1.4 inches in diameter. The top of the domes shall be 50-60% of the base diameter. Domes shall be 0.2 inches in height.
    5. Mounting:
        a. Permanently embedded detectable warning tile wet-set into freshly poured concrete.
        b. Detectable warning tile set into formed recess in concrete and adhered with mortar.
        c. Replaceable detectable warning tile wet-set into freshly poured concrete and surface-fastened to permanently embedded anchors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions. Verify that installation of tactile warning surfacing will comply with accessibility requirements upon completion.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF TACTILE WARNING SURFACING

A. General: Prepare substrate and install tactile warning surfacing according to manufacturer's written instructions unless otherwise indicated.

B. Detectable warning surface shall be located so that the edge nearest the curb line is 6-8 inches from the face of curb. For skewed applications, detectable warning shall be placed such that the domes closest to the back of curb are no less than 0.5 inches and no more than 3 inches from the back of curb.

C. Truncated dome surfaces shall be fabricated to provide full domes only.

D. Detectable warning surfaces are required at all roadway crossings.

E. Ensure that the vertical edges of the installed system are not more than 0.5 inches above the adjacent surfaces. Place a 2:1 or flatter bevel on edges that are more than 0.25 inches above the adjacent surface.

3.03 INSTALLATION OF DETECTABLE WARNING TILES

A. Cast-in-Place Detectable Warning Tiles:
   1. Concrete Paving Installation: Comply with installation requirements in Section 32 13 13 "Concrete Paving." Mix, place, and finish concrete to conditions complying with detectable warning tile manufacturer's written requirements for satisfactory embedment of tile.
   2. Set each detectable warning tile accurately and firmly in place and completely seat tile back and embedment's in wet concrete by tamping or vibrating. If necessary, temporarily apply weight to tiles to ensure full contact with concrete.
   3. Set surface of tile flush with surrounding concrete and adjacent tiles, with variations between tiles and between concrete and tiles not exceeding plus or minus 1/8 inch flush.
   4. Protect exposed surfaces of installed tiles from contact with wet concrete. Complete finishing of concrete paving surrounding tiles. Remove concrete from tile surfaces.
   5. Clean tiles using methods recommended in writing by manufacturer.

3.04 CLEANING AND PROTECTION

A. Remove and replace tactile warning surfacing that is broken or damaged or does not comply with requirements in this Section. Remove in complete sections from joint to joint unless otherwise approved by Engineer. Replace using tactile warning surfacing installation methods acceptable to Engineer.

B. Protect tactile warning surfacing from damage and maintain free of stains, discoloration, dirt, and other foreign material.

END OF SECTION

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SECTION 32 31 13
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Posts, rails, and frames.

B. Wire fabric.

C. Concrete.

D. Manual gates with related hardware.

E. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete anchorage for posts.

B. Section 08 71 00 - Door Hardware: Gate locking device.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric; 2011a (Reapproved 2022).

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

E. ASTM F567 - Standard Practice for Installation of Chain-Link Fence; 2023.

F. CLFMI CLF-FIG0111 - Field Inspection Guide; 2014.

G. CLFMI CLF-PM0610 - Product Manual; 2017.

H. CLFMI CLF-SFR0111 - Security Fencing Recommendations; 2014.

I. CLFMI WLG 2445 - Wind Load Guide for the Selection of Line Post and Line Post Spacing; 2023.

J. FS RR-F-191/1D - Fencing, Wire and Post Metal (Chain-Link Fence Fabric); 1990.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

C. Design Calculations: For high wind load areas, provide calculations for fence fabric and accessory selection as well as line post spacing and foundation details. See CLFMI WLG 2445 for line post and spacing guidance.

D. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components. See CLFMI CLF-SFR0111 for planning and design recommendations.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Fence Installer: Company with demonstrated successful experience installing similar projects and products, with not less than five years of documented experience.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Line Posts: 1.9 inch diameter.

B. Corner and Terminal Posts: 2.38 inch diameter.

C. Gate Posts: 3-1/2 inch diameter.

D. Top and Brace Rail: 1.66 inch diameter, plain end, sleeve coupled.

E. Bottom Rail: 1.66 inch diameter, plain end, sleeve coupled.

F. Gate Frame: 1.66 inch diameter for welded fabrication.

G. Fabric: 2 inch diamond mesh interwoven wire, 6 gauge, 0.1920 inch thick, top selvage knuckle end closed, bottom selvage twisted tight.

H. Privacy Fabic: High-density polyethylene (HDPE), woven into fabric.
   1. Minimum Opacity: 85%
   2. Color: Frommanufacturer's full range.
   3. Grommets included.
   4. Fastners: Stainless Steel.

I. Tension Wire: 6 gauge, 0.1920 inch thick steel, single strand.

J. Tie Wire: Aluminum alloy steel wire.

2.02 MATERIALS

A. Posts, Rails, and Frames:
   1. Formed from hot-dipped galvanized steel sheet, ASTM A653/A653M, HSLAS, Grade 50, with G90 (Z275) zinc coating.
   2. Line Posts: Type I round in accordance with FS RR-F-191/1D.
   3. Terminal, Corner, Rail, Brace, and Gate Posts: Type I round in accordance with FS RR-F-191/1D.

B. Wire Fabric:
   1. ASTM A392 zinc coated steel chain link fabric.
   2. Comply with CLFMI CLF-PM0610.

C. Concrete:
   1. Type specified in Section 03 30 00.

2.03 MANUAL GATES AND RELATED HARDWARE

A. Hardware for Single Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; fork latch with gravity drop and padlock hasp; keeper to hold gate in fully open position.

B. Hardware for Double Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; drop bolt on inactive leaf engaging socket stop set in concrete, active leaf latched to inactive leaf preventing raising of drop bolt, padlock hasp; keepers to hold gate in fully open position.

C. Hinges: Finished to match fence components.
   1. Brackets: Round.
   2. Mounting: Center.
   3. Closing: Manual.

D. Latches: Finished to match fence components.
   1. Brackets: Round.
   2. Locking: Magnetic.

2.04 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

2.05 FINISHES

A. Components (Other than Fabric): Galvanized in accordance with ASTM A123/A123M, at 1.7 ounces per square foot.

B. Components and Fabric: Vinyl coated over coating of 1.8 ounces per square foot galvanizing.

C. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.

D. Accessories: Same finish as framing.

E. Color(s): To be selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that areas are clear of obstructions or debris.

3.02 PREPARATION

A. Removal: Obstructions or debris.

3.03 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Place fabric on outside of posts and rails.

C. Set intermediate posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.

D. Line Post Footing Depth Below Finish Grade: ASTM F567.

E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567.

F. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.

G. Provide top rail through line post tops and splice with 6 inch long rail sleeves.

H. Install center brace rail on corner gate leaves.

I. Do not stretch fabric until concrete foundation has cured 28 days.

J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

K. Position bottom of fabric 2 inches above finished grade.

L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

N. Install bottom tension wire stretched taut between terminal posts.

O. Do not attach the hinged side of gate to building wall; provide gate posts.

P. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

Q. Peen all bolts upon installation.

R. Perform three random field inspections confirming proper installation.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Position: 1 inch.

3.05 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.

C. Post Settings: Randomly inspect three locations against design for:
   1. Hole diameter.
   2. Hole depth.
   3. Hole spacing.

D. Fence Height: Randomly measure fence height at three locations or at areas that appear out of compliance with design.

E. Gates: Inspect for level, plumb, and alignment.

F. Workmanship: Verify neat installation free of defects. See CLFMI CLF-FIG0111 for field inspection guidance.

3.06 CLEANING

A. Leave immediate work area neat at end of each work day.

B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

C. Clean fence with mild household detergent and clean water rinse well.

D. Remove mortar from exposed posts and other fencing material using a 10 percent solution of muriatic acid followed immediately by several rinses with clean water.

E. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

F. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

END OF SECTION

SECTION 32 31 19
DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Decorative aluminum fences.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 31 23 16 - Excavation.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section; require attendance by affected installers.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Design Calculations: For high wind load areas, provide calculations for fence panels and accessory selection as well as line post spacing and foundation details. See CLFMI WLG 2445 for line post and spacing guidance.

D. Shop Drawings:
   1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

E. Field Inspection Records: Provide installation inspection records that include post settings, framework, fittings and accessories, gates, and workmanship.

F. Manufacturer's Warranty.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified and approved by fence manufacturer.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Decorative Metal Fences and Gates:
   1. Ameristar Perimeter Security, USA: www.ameristarperimeter.com/#sle.
   2. CDH Custom Roll Form, LLC; Palisade Security Fence: www.cdhrollform.com/#sle.
   3. Levante Architectural Aluminum: www.levantealuminum.com/#sle.
   4. Superior Aluminum Products, Inc: www.superioraluminum.com/#sle.

B. Specialty Hardware:
   1. DAC Industries, Inc; Detex Exit Bar: www.dacindustries.com/#sle.
   2. D&D Technologies USA, Inc ; _____: www.ddtech.com/#sle.

2.02 FENCES

A. Fences: Complete factory-fabricated system of posts and panels, accessories, fittings, and fasteners; finished with electrodeposition coating, and having the following performance characteristics:
   1. Capable of resisting vertical load, horizontal load and infill performance requirements for fence categories defined in ASTM F2408.

B. Electro-Deposition Coating: Multistage pretreatment/wash with zinc phosphate, followed by epoxy primer and acrylic topcoat.
   1. Total Coating Thickness: 2 mils, minimum.
   2. Color: As selected by Architect from manufacturer's standard range.
   3. Coating Performance: Comply with general requirements of ASTM F2408.
      a. Adhesion: ASTM D3359 (Method B); Class 3B with 90 percent or more of coating remaining in tested area.
      b. Impact Resistance: ASTM D2794; 60 inch pounds.
      c. Weathering Resistance: ASTM D523, ASTM D822/D822M and ASTM D2244; less than 60 percent loss of gloss.

C. Aluminum: ASTM B221.
   1. Tubular Pickets, Rails and Posts: 6005-T5 alloy.
   2. Extrusions for Posts and Rails (Outer Channel): 6005-T5 alloy.
   3. Extrusions for Pickets and Rail (Inner Slide Channels): 6063-T5 alloy.

D. Fasteners: ASTM A276/A276M, Type 302 stainless steel; finished to match fence components.
   1. Tamper-proof security bolts.

E. Hinges: Finished to match fence components.
   1. Brackets: Round.
   2. Mounting: Center.
   3. Closing: Manual.

F. Latches: Finished to match fence components.
   1. Brackets: Round.
   2. Locking: Magnetic.

2.03 ALUMINUM FENCE

A. Decorative Aluminum Fence System: Provide fence meeting the Test Load and Coating Performance requirements of ASTM F2408 for Industrial class.
   1. Fence Panels: 6 feet high by 6 feet long.
      a. Panel Style: Three rail.
      b. Panel Strength: Capable of supporting 270 pounds minimum load applied at midspan without deflection.
      c. Attach panels to posts with manufacturer's standard panel brackets and recommended fasteners.
      d. Posts: Aluminum extrusions; 2-1/2 inches square.
      e. Rails: Extruded aluminum channels.
         1) Double-walled aluminum U-channel; outside cross-section dimensions of 1-3/4 inch square; interior guide channel forms lower limit of raceway for retaining rod.
         2) Enclosed Retaining Rod: 1/8 inch diameter galvanized steel with variable pitch connection system for high angle racking and elimination of external fasteners.
         3) Picket-to-Rail Intersection Seals: PVC grommets.
         4) Picket Spacing, Standard: 4.715 inch on center.
      f. Pickets: Extruded aluminum tubes.
         1) Style: Flush top rail.

g. Fasteners: Manufacturer's standard stainless steel bolts, screws, and washers; factory finish fasteners to match fence.
h. Accessories: Aluminum castings, extrusions, and cold-formed strips; factory finished to match fence.
1) Flat post cap.
i. Color: As selected by Architect from manufacturer's standard range.

B. Decorative Aluminum Post-and-Rail Fence and Swinging Gates:
1. Style: Three-rail.
2. Posts: Aluminum extrusions; 4 inches square.
3. Color: As selected by Architect from manufacturer's standard range.

2.04 ACCESSORIES

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Set fence posts in accordance with the manufacturer recommended spacing.

C. When cutting rails immediately seal the exposed surfaces by:
1. Removing metal shavings from cut area.
2. Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; allow to dry.
3. Apply two coats of custom finish spray paint matching fence color.
4. Failure to seal exposed surfaces in accordance with manufacturer's instructions will negate manufacturer's warranty.

D. Space gate posts according to the manufacturers' drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.
1. Base type and quantity of gate hinges on the application, weight, height, and number of gate cycles.
2. Identify the necessary hardware required for the application on the manufacturer's gate drawings.
3. Provide gate hardware by the manufacturer of the gate and install in compliance with manufacturer's recommendations.

E. Excavate post holes in accordance with Section 31 23 16.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From Indicated Position: 1 inch.

C. Minimum Distance from Property Line: 6 inches.

3.05 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.

C. Post Settings: Randomly inspect three locations against design for:
1. Hole diameter.
2. Hole depth.
3. Hole spacing.

D. Fence Height: Randomly measure fence height at three locations or at areas that appear out of compliance with design.

E. Gates: Inspect for level, plumb, and alignment.

F. Workmanship: Verify neat installation free of defects.

3.06 CLEANING

A. Leave immediate work area neat at end of work day.

B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

C. Clean fence with mild household detergent and clean water rinse well.

D. Remove mortar from exposed posts and other fencing material using a 10 percent solution of muriatic acid followed immediately by several rinses with clean water.

E. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

F. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Demonstrate proper operation of equipment to Owner's designated representative.

3.08 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 33 11 13
FACILITY WATER DISTRIBUTION PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Veolia Water Standard Specifications for Water Distribution and Details for Water Service.

1.02 SUMMARY

A. This Section includes water-distribution piping and related components outside the building for combined water service and fire-service mains.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Product data shall be submitted to the Project Engineer and Veolia Water at least four weeks prior to starting work.

B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components. Shop drawings shall be submitted to the Project Engineer and Veolia Water at least four weeks prior to starting work.

1.04 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.

B. Field quality-control test reports.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

B. As-Built drawings shall be submitted to the Project Engineer and Veolia Water after the successful completion of pressure testing and chlorination.

1.06 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with requirements of Veolia Water. Include tapping of water mains and backflow prevention.
   2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
   3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

D. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.
   1. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
   1. Ensure that valves are dry and internally protected against rust and corrosion.
   2. Protect valves against damage to threaded ends and flange faces.
   3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
   1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
   2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.08 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
   1. Notify Engineer and Veolia Water no fewer than three days in advance of proposed interruption of service.
   2. Do not proceed with interruption of water-distribution service without Engineer and Veolia Water's written permission.

1.09 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Comply with requirements in "Piping Application" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372.

2.02 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
   1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
   2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
   1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
   2. Gaskets: AWWA C111, rubber.

C. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.
   1. Grooved-End, Ductile-Iron Pipe Appurtenances:
      a. Grooved-End, Ductile-Iron Fittings: ASTM A47/A47M, malleable-iron castings or ASTM A536, ductile-iron castings with dimensions matching pipe.
      b. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

D. Flanges: ASME 16.1, Class 125, cast iron.

2.03 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:
   1. Nonrising-Stem, Resilient-Seated Gate Valves:
      a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
         1) Standard: AWWA C509.
         2) Minimum Pressure Rating: 200 psig .
         3) End Connections: Mechanical joint.
         4) Interior Coating: Complying with AWWA C550.
   2. Nonrising-Stem, High-Pressure, Resilient-Seated Gate Valves:
      a. Description: Ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut.
         1) Standard: AWWA C509.
         2) Minimum Pressure Rating: 250 psig .
         3) End Connections: Push on or mechanical joint.
         4) Interior Coating: Complying with AWWA C550.
   3. OS&Y, Rising-Stem, Resilient-Seated Gate Valves:
      a. Description: Cast- or ductile-iron body and bonnet, with bronze or gray- or ductile-iron gate, resilient seats, and bronze stem.
         1) Standard: AWWA C509.
         2) Minimum Pressure Rating: 200 psig .
         3) End Connections: Flanged.

2.04 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:
   1. Description: Sleeve and valve compatible with drilling machine.
      a. Standard: MSS SP-60.
      b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
      c. Valve: AWWA, cast-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.
   1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.05 CHECK VALVES

A. AWWA Check Valves:
   1. Description: Swing-check type with resilient seat. Include interior coating according to AWWA C550 and ends to match piping.
      a. Standard: AWWA C508.
      b. Pressure Rating: 175 psig.

B. UL/FMG, Check Valves:
   1. Description: Swing-check type with pressure rating; rubber-face checks, unless otherwise indicated; and ends matching piping.
      a. Standards: UL 312 and FMG approved.
      b. Pressure Rating: 175 psig.

2.06 DETECTOR CHECK VALVES

A. Detector Check Valves:
   1. Description: Galvanized cast-iron body, bolted cover with air-bleed device for access to internal parts, and flanged ends. Include one-piece bronze disc with bronze bushings, pivot, and replaceable seat. Include threaded bypass taps in inlet and outlet for bypass meter connection. Set valve to allow minimal water flow through bypass meter when major water flow is required.
      a. Standards: UL 312 and FMG approved.
      b. Pressure Rating: 175 psig .
      c. Water Meter: AWWA C700, disc type, at least one-fourth size of detector check valve. Include meter, bypass piping, gate valves, check valve, and connections to detector check valve.
   2. Description: Iron body, corrosion-resistant clapper ring and seat ring material, flanged ends, with connections for bypass and installation of water meter.
      a. Standards: UL 312 and FMG approved.
      b. Pressure Rating: 175 psig.

2.07 CORPORATION VALVES AND CURB VALVES

A. Manufacturers:

B. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.
   1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
   2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.
   3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.

C. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

D. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.
   1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

2.08 WATER METERS

A. Water meters will be furnished by the Contractor.

B. Manufacturers:
   1. As required by Veolia Water.

2.09 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:
   1. As required by Veolia Water.

B. Double-Check, Backflow-Prevention Assemblies:
   1. As required by Veolia Water.

2.10 CONCRETE VAULTS

A. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C857 and made according to ASTM C858.
   1. Ladder: MOSHA aluminum with safety extension bar against outside bar of ladder.
   2. Access Hatch: Bilco Model JH-20

2.11 FIRE DEPARTMENT CONNECTIONS

A. General
   1. Comply with UL 405.
   2. Minimum pressure rating: 175 psig.
   3. Body: Corrosion-resistant metal.
   4. Inlets: Brass with threads in accordance with NFPA 1963 and matching local fire department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
   5. Caps: Brass, lugged type, with gasket and chain.
   6. Escutcheon Plate Marking: “AUTO SPKR”.
   7. Manufacturers: Elkhart Brass, Fire-End & Croker, Fire Protection Products, Guardian Fire Equipment, Wilson and Cousins.

B. Type A: Flush-type fire department connection for wall mounting
   1. Finish: Rough brass or bronze.
   2. Escutcheon Plate: Rectangular, brass, wall type.
   3. Outlet Location: Back.
   4. Outlet Size: 6-inch.
   5. Body Style: Horizontal.
   6. Number of Inlets: Two.
   7. Inlet Size: 2-1/2-inch.

2.12 ALARM DEVICES

A. Alarm Devices, General: UL 753 and FMG approved, of types and sizes to mate and match piping and equipment.

B. Supervisory Switches: Single pole, double throw; designed to signal valve in other than fully open position.

PART 3 EXECUTION

3.01 EARTHWORK

A. Refer to Section 31 20 00 "Earth Moving" for excavating, trenching, and backfilling.

3.02 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground and vault water-service piping shall be the following:
   1. Ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.

F. Underground and vault Fire-Service-Main Piping shall be the following:
   1. Ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.

3.03 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, resilient-seated gate valves with valve box.
2. Underground Valves, NPS 4 and Larger, for Indicator Posts: UL/FMG, cast-iron, nonrising-stem gate valves with indicator post.
3. Use the following for valves in vaults and aboveground:
   a. Gate Valves, NPS 2 and Smaller: Bronze, nonrising stem.
   b. Gate Valves, NPS 3 and Larger: AWWA, cast iron, OS&Y rising stem, resilient seated.
   c. Check Valves: AWWA C508, swing type.
4. Pressure-Reducing Valves: Use for water-service piping in vaults and aboveground to control water pressure.
5. Relief Valves: Use for water-service piping in vaults and aboveground.
   a. Air-Release Valves: To release accumulated air.
   b. Air/Vacuum Valves: To release or admit large volume of air during filling of piping.
   c. Combination Air Valves: To release or admit air.
6. Detector Check Valves: Use for water-service piping in vaults and aboveground to detect unauthorized use of water.

3.04 PIPING SYSTEMS - COMMON REQUIREMENTS

A. See Section 33 05 00 "Common Work Results for Utilities" for piping-system common requirements.

3.05 PIPING INSTALLATION

A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.

B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.

C. Make connections larger than NPS 2 with tapping machine according to the following:
   1. Install tapping sleeve and tapping valve according to MSS SP-60.
   2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
   3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
   4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

D. Make connections NPS 2 and smaller with drilling machine according to the following:
   1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
   2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
   3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
   4. Install corporation valves into service-saddle assemblies.
   5. Install manifold for multiple taps in water main.
   6. Install curb valve in water-service piping with head pointing up and with service box.

E. Comply with NFPA 24 for fire-service-main piping materials and installation.
   1. Install PE corrosion-protection encasement according to ASTM A674 or AWWA C105.
   2. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

F. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.
   1. Install PE corrosion-protection encasement according to ASTM A674 or AWWA C105.

G. Bury piping with depth of cover over top at least 42 inches.

H. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

I. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.
   1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

J. Sleeves are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

K. Mechanical sleeve seals are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

L. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

M. See Section 211200 "Fire-Suppression Standpipes," Section 211313 "Wet-Pipe Sprinkler Systems," and Section 211316 "Dry-Pipe Sprinkler Systems" for fire-suppression-water piping inside the building.

N. See Section 221116 "Domestic Water Piping" for potable-water piping inside the building.

3.06 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Comply with requirements for hangers, supports, and anchor devices specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

C. Install the following pipe attachments:
   1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
   2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
   3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
   4. Spring hangers to support vertical runs.
   5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

D. Install hangers for copper tubing with maximum spacing and minimum rod diameters to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

E. Support horizontal piping within 12 inches of each fitting and coupling.

F. Support vertical runs of copper tubing to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.07 JOINT CONSTRUCTION

A. See Section 330500 "Common Work Results for Utilities" for basic piping joint construction.

B. Make pipe joints according to the following:
   1. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools and procedures recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly.
   2. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
   3. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
   4. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.

3.08 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.
2. Locking mechanical joints.
3. Set-screw mechanical retainer glands.
4. Bolted flanged joints.
5. Heat-fused joints.
6. Pipe clamps and tie rods.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
   1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
   2. Fire-Service-Main Piping: According to NFPA 24.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.09 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.

C. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.

D. UL/FMG, Valves Other Than Gate Valves: Comply with NFPA 24.

E. MSS Valves: Install as component of connected piping system.

F. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

G. Pressure-Reducing Valves: Install in vault or aboveground between shutoff valves.

H. Relief Valves: Comply with AWWA C512. Install aboveground with shutoff valve on inlet.

3.10 DETECTOR-CHECK VALVE INSTALLATION

A. Install in vault or aboveground.

B. Install for proper direction of flow. Install bypass with water meter, gate valves on each side of meter, and check valve downstream from meter.

C. Support detector check valves, meters, shutoff valves, and piping on brick or concrete piers.

3.11 WATER METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written instructions.

B. Water Meters: Install electromagnetic-type water meters, NPS 2 and larger, in meter vaults. Include shutoff valves on water meter inlets and outlets and valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.

3.12 ROUGHING-IN FOR WATER METERS

A. Rough-in piping and specialties for water meter installation according to utility company's written instructions.

3.13 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.

B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.

C. Do not install bypass piping around backflow preventers.

D. Support NPS 2-1/2 and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

3.14 CONCRETE VAULT INSTALLATION

A. Install precast concrete vaults according to ASTM C891.

3.15 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install ball drip valves at each check valve for fire department connection to mains.

3.16 ALARM DEVICE INSTALLATION

A. General: Comply with NFPA 24 for devices and methods of valve supervision. Underground valves with valve box do not require supervision.

B. Supervisory Switches: Supervise valves in open position.
   1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.
   2. Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Install switch, with toggle against target plate, on barrel of indicator post.

C. Connect alarm devices to building fire alarm system. Wiring and fire-alarm devices are specified in Section 284621.11 "Addressable Fire-Alarm Systems."

3.17 CONNECTIONS

A. See Section 330500 "Common Work Results for Utilities" for piping connections to valves and equipment.

B. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve.

C. Connect water-distribution piping to interior domestic water and fire-suppression piping.

D. Waste from concrete vault drains to a stone sump extending 3 feet below the vault.

E. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

F. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.18 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
   1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig . Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.19 IDENTIFICATION

A. Install continuous underground warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 312000 "Earth Moving."

B. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel. See Section 330500 "Common Work Results for Utilities" for identifying devices.

3.20 CLEANING

A. Clean and disinfect water-distribution piping as follows:
   1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.

2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
    a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
    b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
    c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION

SECTION 33 31 13
FACILITY SANITARY SEWERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. PVC pipe and fittings.
   2. Cleanouts.
   3. Manholes.
   4. Concrete.

1.03 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Pipe and fittings.
   2. Cleanouts.

B. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

1.04 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:
   1. Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from sewer system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
   2. Show system piping in profile. Draw profiles to horizontal scale of not less than 1 inch equals 50 feet (1:500) and to vertical scale of not less than 1 inch equals 5 feet (1:50). Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

B. Product Certificates: For each type of pipe and fitting.

C. Field quality-control reports.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.06 FIELD CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
   1. Notify Owner and Construction Manager no fewer than three days in advance of proposed interruption of service. Interruption to businesses will not be permitted during normal business hours.
   2. Do not proceed with interruption of service without Owner or Construction Manager’s written permission.

PART 2 PRODUCTS

2.01 PVC PIPE AND FITTINGS

A. PVC Type PSM Sewer Piping:
   1. Pipe: ASTM D3034, SDR 26, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
   2. Fittings: ASTM D3034, PVC with bell ends.

3. Gaskets: ASTM F477, elastomeric seals.

B. PVC Pressure Piping:
1. Pipe: ASTM D1785, Schedule 40PVC, with plain ends for solvent-cemented joints.
2. Fittings: ASTM D2466, Schedule 40 PVC, socket type.

2.02 CLEANOUTS

A. Cast-Iron Covers:
1. Source Limitations: Obtain cast-iron cleanouts from single manufacturer.
2. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
3. Top-Loading Classification(s): Heavy Duty.

B. PVC Cleanouts:
1. Source Limitations: Obtain PVC cleanouts from single manufacturer.
2. Description: Mechanical type end of pipe gripper plug .

2.03 MANHOLES

A. Standard Precast Concrete Manholes:
1. Description: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
4. Base Section: 8-inch minimum thickness for floor slab and 6-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
5. Riser Sections: 6-inch minimum thickness, of length to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual rungs in vertical alignment at 12” spacing as per New Castle County Standard Details. Rung type shall be plastic coated using a minimum 1/2-inch diameter steel reinforcing rod meeting the requirements of ASTM A615 as a core. Plastic coating shall meet the requirements of ASTM 2146, Type II, Grade 4375B.
10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope, not to exceed 24 inches.

B. Manhole Frames and Covers:
1. Description: Ferrous; 24-inch ID by 9-inch riser, with 5-inch- minimum-width flange and 25-7/8-inch diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
2. Material: ASTM A48, Class 308 iron unless otherwise indicated.

C. Manhole-Cover Inserts:
1. Description; Manufactured, plastic form, of size to fit between manhole frame and cover and designed to prevent stormwater inflow. Include handle for removal and gasket for gastight sealing.
2. Type: Solid.

2.04 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318 and the following:
1. Cement: ASTM C150, Type II.
2. Fine Aggregate: ASTM C33, sand.
3. Coarse Aggregate: ASTM C33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
   1. Reinforcing Fabric: ASTM A1064, steel, welded wire fabric, plain.
   2. Reinforcing Bars: ASTM A615, Grade 60 deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
   1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
      a. Invert Slope: 1 percent through manhole.
   2. Benches: Concrete, sloped to drain into channel.
      a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
   1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
   2. Reinforcing Bars: ASTM A615/A615M, Grade 60 deformed steel.

PART 3 EXECUTION

3.01 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.02 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details to indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure, drainage piping according to the following:
   1. Install piping pitched down in direction of flow, at slope shown on construction plans. Minimum slope of 2 percent unless otherwise indicated.
   2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
   3. Install piping with 36-inch minimum cover.
   4. Install PVC Type PSM sewer piping according to ASTM D2321 and ASTM F1668.

G. Install force-main, pressure piping according to the following:
   1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
   2. Install piping with 36-inch minimum cover.
      a. Install PVC pressure piping according to ASTM D2321 and ASTM F1668.

H. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.03 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:
   1. Join PVC Type PSM sewer piping according to ASTM D2321 and ASTM D3034 for elastomeric-seal joints or ASTM D3034 for elastomeric-gasket joints.
   2. Join dissimilar pipe materials with nonpressure-type, flexible couplings.

B. Join force-main, pressure piping according to the following:
   1. Join PVC pressure piping in accordance with ASTM D2855 for solvent-cemented joints.
   2. Join dissimilar pipe materials with pressure-type couplings.

3.04 MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C891.

C. Form continuous concrete channels and benches between inlets and outlet.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

E. Install manhole-cover inserts in frame and immediately below cover.

3.05 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.06 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Install piping so cleanouts open in direction of flow in sewer pipe.
   1. Use Heavy-Duty, top-loading classification cleanouts.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 26 by 26 by 8 inches deep. Set with tops flush with surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.07 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Section 221316 "Sanitary Waste and Vent Piping."

B. Connect force-main piping to building's sanitary force mains specified in Section 221316 "Sanitary Waste and Vent Piping." Terminate piping where indicated.

C. Make connections to existing piping and underground manholes.
   1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
   2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
   3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of, and be flush with, inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.08 IDENTIFICATION

A. Comply with requirements in Section 312000 "Earth Moving" for underground utility identification devices. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.
1. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.09 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:
a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours advance notice.
4. Submit separate report for each test.
5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
a. Fill sewer piping with water. Test with pressure of at least 10-foot head of water and maintain such pressure without leakage for at least 15 minutes.
b. Close openings in system and fill with water.
c. Purge air and refill with water.
d. Disconnect water supply.
e. Test and inspect joints for leaks.
6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
a. Test plastic gravity sewer piping according to ASTM F1417.
b. Test concrete gravity sewer piping according to ASTM C1628.
7. Force Main: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 150 psig.
a. Ductile-Iron Piping: Test according to AWWA C600, "Hydraulic Testing" Section.
b. PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.
8. Manholes: Perform hydraulic test according to ASTM C969.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials and repeat testing until leakage is within allowances specified.

3.10 CLEANING

A. Clean dirt and superfluous material from interior of piping and flush with potable water.

END OF SECTION

SECTION 33 42 00
STORMWATER CONVEYANCE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. HDPE pipe and fittings.
   2. PVC pipe and fittings.
   3. Cleanouts.
   4. Manholes.
   5. Concrete.
   6. Plastic, channel drainage systems.
   7. Catch basins and storm drain Inlets.
   8. Pipe outlets.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
   1. Manholes: Include plans, elevations, sections, details, frames, and covers.
   2. Catch basins and stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.

1.04 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of pipe and fitting, from manufacturer.

B. Field quality-control reports.

1.05 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes in accordance with manufacturer's written rigging instructions.

D. Handle catch basins and stormwater inlets in accordance with manufacturer's written rigging instructions.

1.07 FIELD CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service in accordance with requirements indicated:
   1. Notify Construction Manager no fewer than three days in advance of proposed interruption of service.
   2. Do not proceed with interruption of service without Construction Manager's written permission.

PART 2 PRODUCTS

2.01 HDPE PIPE AND FITTINGS

A. Source Limitations: Obtain HDPE pipe and fittings from single manufacturer.

B. HDPE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252, soil tight with bell and spigot, with smooth waterway for coupling joints.

C. HDPE Drainage Pipe and Fittings NPS 12 to NPS 60: AASHTO M 294, soil tight with bell and spigot, with smooth waterway for coupling joints.

D. HDPE Soil tight Couplings: AASHTO M 294, corrugated, matching pipe and fittings.

2.02 PVC PIPE AND FITTINGS

A. PVC Water-Service Piping:
   1. Pipe: ASTM D1785, Schedule 40 PVC, with plain ends for solvent-cemented joints.
   2. Fittings: ASTM D2466, Schedule 40 PVC, socket type.

2.03 CLEANOUTS

A. Cast-Iron Covers:
   1. Source Limitations: Obtain cast-iron cleanouts from single manufacturer.
   2. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside caulk or spigot connection and countersunk, tapered-thread, brass closure plug.
   3. Top-Loading Classification(s): Heavy Duty.

B. PVC Cleanouts:
   1. Source Limitations: Obtain PVC cleanouts from single manufacturer.
   2. Description: PVC body with PVC threaded plug. Include 6” Schedule 40 PVC pipe, fitting, and riser to cleanout.

2.04 MANHOLES

A. Standard Precast Concrete Manholes:
   1. Description: AASHTO M199, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
   2. Diameter: 60 inches minimum unless otherwise indicated.
   3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
   4. Base Section: 8-inch minimum thickness for floor slab and 6-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
   5. Riser Sections: 6-inch minimum thickness, and lengths to provide depth indicated.
   6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
   7. Joint Sealant: ASTM C990, bitumen or butyl rubber.
   8. Resilient Pipe Connectors: ASTM C923, cast or fitted into manhole walls, for each pipe connection.
   9. Steps: Individual rungs in vertical alignment at 1’-4” maximum center to center spacing. Rung types shall be in accordance with Delaware Department of Transportation Standards.
   10. Grade Rings: Reinforced-concrete rings, in accordance with Delaware Department of Transportation Standards.

B. PVC Manholes:
   1. Source Limitations: Obtain PVC manholes from single manufacturer.
   2. Description: ASTM D1784 Cell Class 12454.
   3. Diameter: 8 inches minimum unless otherwise indicated.
   4. Ballast: Increase thickness of concrete base as required to prevent flotation.
   5. Base Section: Crushed stone or other granular material meeting the requirements of Class I, II, or Class III material as defined in ASTM D2321.
   6. Pipe Connectors: Cast or fitted into manhole walls, for each pipe connection. Joint tightness to conform to ASTM D3212 for corrugated HDPE and PVC sewer.

C. Manhole Frames and Covers for PVC Manholes:
   1. Description: Ferrous; 10-inch to 15-inch ID with hinged grate and 30-inch ID frame and cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."

2. Material: ASTM A536, Grade 70-50-05 ductile iron, painted black unless otherwise indicated.

D. Manhole Frames and Covers for Precast Manholes:
1. Standard Type A Manhole frame and cover in accordance with Delaware Department of Transportation Standards.

2.05 CONCRETE

A. General: Cast-in-place concrete in accordance with DelDOT Class A or B, and the following:
1. Cement: ASTM C150, Type II.
2. Fine Aggregate: ASTM C33, sand.
3. Coarse Aggregate: ASTM C33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
1. Reinforcing Fabric: ASTM A1064, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A615, Grade 60 deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4500 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
2. Benches: Concrete, sloped to drain into channel.
a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
1. Reinforcing Fabric: ASTM A1064, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A615, Grade 60 deformed steel.

2.06 PLASTIC, CHANNEL DRAINAGE SYSTEMS

A. FRP Channel Drainage Systems:
1. Source Limitations: Obtain FRP channel drainage systems from single manufacturer.
2. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
3. Channel Sections: Interlocking-joint, sloped-invert, FRP modular units, with end caps. Include flat, rounded, or inclined inside bottom, with outlets in number, sizes, and locations indicated.
a. Dimensions: 6 inches wide. Include number of units required to form total lengths indicated.
b. Frame: Stainless steel with ½” wide ADA compliant slots.
4. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.
5. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

B. HDPE or PE Channel Drainage Systems:
1. Source Limitations: Obtain HDPE or PE channel drainage systems from single manufacturer.
2. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
3. Channel Sections: Interlocking-joint, HDPE or PE modular units, with end caps. Include flat, rounded, or inclined bottom, with level invert and with outlets in number, sizes, and locations indicated.
a. Dimensions: 8 and 12 inches wide. Include number of units required to form total lengths indicated.

4. Grates: With slots or perforations and widths and thickness that fit recesses in channel sections.
    a. Material: Aluminum frame manufactured from 0.063” tempered commercial aluminum meeting the requirements of ASTM B209, consisting of two parallel plates separated by spacers spanning the slot on 6” centers. The grate shall be ½” #13 galvanized steel with a diamond-shaped opening and be ADA compliant.
5. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.
6. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

2.07 CATCH BASINS AND STORM DRAIN INLETS

A. PVC Drain Basins:
    1. Description: ASTM D1784 Cell Class 12454 PVC pipe stock.
    2. Base Section: Crushed stone or other granular material meeting the requirements of Class I, II, or Class III material as defined in ASTM D2321.
    3. Joint Sealant: ASTM C990, bitumen or butyl rubber.
    4. Pipe Connectors: Cast or fitted into manhole walls, for each pipe connection. Joint tightness to conform to ASTM D3212 for corrugated HDPE and PVC sewer.

B. Frames and Grates: ASTM A536, Grade 60-40-18, ductile iron designed for A-16 (AASHTO HS20-44), structural loading. Include flat grate with small square or short-slotted drainage openings.
    1. Size: 24 by 24 inches minimum unless otherwise indicated.
    2. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2.08 PIPE OUTLETS

A. Flared End Sections: HDPE end section secured with threaded rod with wing nuts and spacers to attach to pipe section.

B. Energy Dissipaters: Provide rip rap outlet protection in accordance with drawings (Sheet F-ESD-5).

PART 3 EXECUTION

3.01 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.02 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow, nonpressure drainage piping in accordance with the following:
    1. Install piping pitched down in direction of flow.
    2. Install piping with 12 inch minimum cover.
    3. Install PE corrugated sewer piping in accordance with ASTM D2321.
    4. Install PVC piping in accordance with ASTM D2321 and ASTM F1668.
    5. Install PVC profile gravity piping in accordance with ASTM D2321 and ASTM F1668.

6. Install PVC piping in accordance with ASTM D2321 and ASTM F1668.

F. Install force-main pressure piping in accordance with the following:
   1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
   2. Install piping with 36 inch- minimum cover.
   3. Install PVC pressure piping in accordance with AWWA M23, or ASTM D2774 and ASTM F1668.
   4. Install PVC piping in accordance with ASTM D2774 and ASTM F1668.

3.03 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping in accordance with the following:
   1. Join corrugated-PE piping in accordance with ASTM D3212 for push-on joints.
   2. Join PVC piping in accordance with ASTM D2321 and ASTM D3034 for elastomeric-seal joints or ASTM D3034 for elastomeric-gasketed joints.
   3. Join PVC profile gravity piping in accordance with ASTM D2321 for elastomeric-seal joints or ASTM F794 for gasketed joints.
   4. Join dissimilar pipe materials with nonpressure-type flexible couplings.

B. Join force-main pressure piping in accordance with the following:
   1. Join PVC piping in accordance with ASTM D2855 for solvent-cemented joints.
   2. Join dissimilar pipe materials with pressure-type couplings.

3.04 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
   1. Use Heavy-Duty, top-loading classification cleanouts.

B. Set cleanout frames and covers in earth in cast-in-place concrete extending 10” beyond all sides of the pipe, 4 inches deep. Set with tops 0.5 inches above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.05 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants in accordance with ASTM C891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements.

3.06 CATCH BASIN AND STORM DRAIN INLET INSTALLATION

A. Construct catch basins and storm drain inlets to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.07 CONCRETE PLACEMENT

A. Place cast-in-place concrete in accordance with ACI 318.

3.08 CHANNEL DRAINAGE SYSTEM INSTALLATION

A. Install with top surfaces of components, except piping, flush with finished surface.

B. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.

C. Embed channel sections and drainage specialties in accordance with manufacturer recommendations.

D. Fasten grates to channel sections if indicated.

E. Assemble channel sections with flanged or interlocking joints.

3.09 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 22 14 13 "Facility Storm Drainage Piping."

3.10 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
   1. Submit separate reports for each system inspection.
   2. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
      c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.
   3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
   4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems in accordance with requirements of authorities having jurisdiction.
   3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
   4. Submit separate report for each test.
   5. Gravity-Flow Storm Drainage Piping: Test in accordance with requirements of authorities having jurisdiction, UNI-B-6, and the following:
      a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
      b. Option: Test plastic piping in accordance with ASTM F1417.
   6. Force-Main Storm Drainage Piping: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than 150 psig (kPa).
      a. Ductile-Iron Piping: Test in accordance with AWWA C600, "Hydraulic Testing" Section.
      b. PVC Piping: Test in accordance with AWWA M23, "Testing and Maintenance" Chapter.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.11 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION

SECTION 33 46 00
SUBDRAINAGE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Perforated-wall pipe and fittings for underdrain applications.
   2. Drainage conduits.
   3. Geotextile filter fabrics.

1.03 ACTION SUBMITTALS

A. Product Data:
   1. Perforated-wall pipe
   2. Drainage conduits, including rated capacities.
   3. Geotextile filter fabrics.

PART 2 PRODUCTS

2.01 PERFORATED-WALL PIPES AND FITTINGS

A. Perforated HDPE Pipe and Fittings:
   1. 6-inch nominal inside diameter: ASTM F2648, Type HDPE dual wall; slotted with a minimum inlet area of 1 in2/ft; bell and spigot for coupled soil tight joints.
   2. 8-inch nominal inside diameter: ASTM F2648, Type HDPE dual wall; slotted with a minimum inlet area of 1 in2/ft; bell and spigot for coupled soil tight joints.
   3. 10-inch nominal inside diameter: ASTM F2648, Type HDPE dual wall; slotted with a minimum inlet area of 1 in2/ft; bell and spigot for coupled soil tight joints.

B. Perforated PVC Pipe and Fittings:
   1. 6-inch nominal pipe size: ASTM D 1785, Type PVC; perforated with four 3/8” diameter holes per row, 6” on center; solvent welded joints.
   2. Fittings: 6” nominal pipe size: ASTM D 2466 with solvent cements for PVC pipe and fittings per ASTM D 2564.

2.02 SOIL MATERIALS

A. Soil materials are specified in Section 31 20 00 "Earth Moving."

2.03 GEOTEXTILE FILTER FABRICS

A. Description: Fabric of PP or polyester fibers or combination of both.
   1. Filter Fabric: Nonwoven needle-punched geotextile, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with the following properties determined according to AASHTO M 288:
      a. Survivability: Class 1.
      b. Apparent Opening Size: No. 70 sieve, maximum.
      c. Permittivity: 1.1 sec-1 in accordance with ASTM D-4491.
      d. Type: sock and flat style.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.

B. Locate and mark existing utilities, underground structures, and aboveground obstructions before beginning installation and avoid disruption and damage of services.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.03 FOUNDATION DRAINAGE INSTALLATION

A. Place impervious fill material on subgrade adjacent to bottom of footing after concrete footing forms have been removed. Place and compact impervious fill to dimensions indicated, but not less than 6 inches deep and 12 inches wide.

B. Lay flat-style geotextile filter fabric in trench and overlap trench sides.

C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than 4 inches.

D. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with adhesive or tape.

E. Install drainage piping as indicated in Part 3 "Piping Installation" Article for foundation subdrainage.

F. Add drainage course to width of at least 6 inches on side away from wall and to top of pipe to perform tests.

G. After satisfactory testing, cover drainage piping to width of at least 6 inches on side away from footing and above top of pipe to within 12 inches of finish grade.

H. Install drainage course and wrap top of drainage course with flat-style geotextile filter fabric.

I. Place layer of flat-style geotextile filter fabric over top of drainage course, overlapping edges at least 4 inches.

J. Place backfill material over compacted drainage course. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Final backfill to finish elevations and slope away from building.

3.04 RETAINING-WALL DRAINAGE INSTALLATION

A. Lay flat-style geotextile filter fabric in trench and overlap trench sides.

B. Place supporting layer of drainage course over compacted subgrade to compacted depth of not less than 4 inches.

C. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with adhesive or tape.

D. Install drainage piping as indicated in Part 3 "Piping Installation" Article for retaining-wall subdrainage.

E. Add drainage course to width of at least 6 inches on side away from wall and to top of pipe to perform tests.

F. After satisfactory testing, cover drainage piping to width of at least 6 inches on side away from footing and above top of pipe to within 12 inches of finish grade.

G. Place drainage course in layers not exceeding 3 inches in loose depth; compact each layer placed and wrap top of drainage course with flat-style geotextile filter fabric.

H. Place layer of flat-style geotextile filter fabric over top of drainage course, overlapping edges at least 4 inches.

I. Fill to Grade: Place satisfactory soil fill material over compacted drainage course. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Fill to finish grade.

3.05 PIPING INSTALLATION

A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.

1. Underdrain Piping: Install underdrain piping level and with appropriate cover as specified on the drawings.
2. Foundation Subdrainage: Install piping level and with a minimum cover of 28 inches unless otherwise indicated.
3. Underslab Subdrainage: Install piping level.
4. Retaining-Wall Subdrainage: When water discharges at end of wall into stormwater piping system, install piping level and with a minimum cover of 36 inches unless otherwise indicated.
5. Lay perforated pipe with perforations down. In HDPE slot drain applications, place pipe so that one line of perforations is positioned at the low point in the trench.
6. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.

B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.

3.06 PIPE JOINT CONSTRUCTION

A. Join perforated HDPE pipe and fittings with couplings according to ASTM D3212 with loose banded, coupled, or push-on joints.

B. Join perforated PVC pressure pipe and fittings according to ASTM D3212 with loose bell-and-spigot, push-on joints.

C. Special Pipe Couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and fit materials and dimensions of both pipes.

3.07 CLEANOUT INSTALLATION

A. Comply with requirements for cleanouts specified in Section 33 41 00 "Storm Utility Drainage Piping."

B. Cleanouts for Stormwater Management Subdrainage:
1. Install cleanouts from piping to grade. Locate cleanouts at beginning of piping run and at changes in direction. Install fittings so cleanouts open in direction of flow in piping.
2. Use NPS 6 PVC pipe and fittings for piping branch fittings and riser extensions to cleanout. Set cleanout frames and covers in a cast-in-place concrete anchor, extending 10” on each side of the pipe wall by 4 inches deep with ferrule resting on concrete base. Set top of cleanout flush with grade. In vehicular areas, pave to flange sidewall. In landscape areas, bring topsoil, seed and mulch to flange.
3. Comply with requirements for concrete specified in Section 03 30 00 "Cast-in-Place Concrete."

3.08 OBSERVATION WELL INSTALLATION

A. Observation wells within storm water management facilities shall be installed vertically from the bottom of the facility to the surface using perforated pipe wrapped in geotextile filter sock.

B. Observation wells shall bear on steel plates resting on suitable subbase.

C. Install PVC threaded cleanout cap under heavy duty cast iron frame and cover with “C.O.” cast in cover.

3.09 FIELD QUALITY CONTROL

A. Tests and Inspections:
1. After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling.
2. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

B. Drain piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 CLEANING

A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION

SECTION 33 71 19

ELECTRICAL UNDERGROUND DUCTS, DUCTBANKS, AND MANHOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit and duct:
   1. Galvanized steel rigid metal conduit (RMC).
   2. Rigid polyvinyl chloride (PVC) conduit.
   3. Polyvinyl chloride (PVC) plastic utilities duct.

B. Precast concrete manholes.

C. Cast-in-place manhole accessories.

D. Accessories:
   1. Underground warning tape.

1.02 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.

B. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.

C. ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures; 2019.

D. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures; 2019.

E. ASTM C891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures; 2020.

F. ASTM C1037 - Standard Practice for Inspection of Underground Precast Concrete Utility Structures; 2016.

G. ASTM D1002 - Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal); 2010 (Reapproved 2019).

H. ASTM D1598 - Standard Test Methods for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure; 2021.

I. ASTM F512 - Standard Specification for Smooth-Wall Poly(Vinyl Chloride) (PVC) Conduit and Fittings for Underground Installation; 2019.

J. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.

K. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.

L. NEMA TC 6&8 - Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installations; 2020.

M. NEMA TC 9 - Fittings for Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installation; 2020.

N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

P. UL 746C - Polymeric Materials – Use in Electrical Equipment Evaluations; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide for metallic conduit, nonmetallic conduit, and manhole accessories.

C. Shop Drawings: Indicate dimensions, reinforcement, size and locations of openings, and accessory locations for precast manholes.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Project Record Documents: Record actual routing and elevations of underground conduit and duct, and locations and sizes of manholes.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 CONDUIT AND DUCT

A. Rigid Polyvinyl Chloride (PVC) Conduit: NFPA 70, Type PVC; comply with NEMA TC 2 and list and label as complying with UL 651; Schedule 40 unless otherwise indicated; rated for use with conductors rated 90 degrees C.
   1. Fittings: Comply with NEMA TC 3 and list and label as complying with UL 651.
      a. Manufacturer: Same as manufacturer of conduit to be connected.

B. Polyvinyl Chloride (PVC) Plastic Utilities Duct: Comply with NEMA TC 6&8 and ASTM F512; Type EB-20 listed and labeled as complying with UL 651, suitable for burial with concrete encasement.
   1. Fittings: Comply with NEMA TC 9.
      a. Manufacturer: Same as manufacturer of duct to be connected.

2.02 PRECAST CONCRETE MANHOLES

A. Description: Precast manhole designed in accordance with ASTM C858, comprising modular, interlocking sections complete with accessories.

B. Loading: ASTM C857, Class A-16.

C. Shape: Square.

D. Base Section: Include 3 inch deep x 14 inch round sump with cast sleeve, and two 1 inch ground rod openings.

E. Top Section: Include 39 inch diameter grooved opening for frame and cover.

F. Riser Casting: 6 inch, with manhole step cast into frame.

G. Frames and Covers: ASTM A48/A48M; Class 30B gray cast iron, 27 inch size, machine finished with flat bearing surfaces. Provide cover marked ELECTRIC to indicate utility.

H. Duct Entry Provisions: Single duct knockouts.

I. Cable Pulling Irons: Use galvanized rod and hardware. Locate opposite each duct entry. Provide watertight seal.

J. Cable Rack Inserts: Minimum load rating of 800 pounds (365 kg). Locate at ____ feet on center.

K. Cable Rack Mounting Channel: 1-1/2 x 3/4 inch steel channel, 48 inch length. Provide cable rack arm mounting slots on 1-1/2 inch centers.

L. Cable Racks: Steel channel, 1-1/2 x 3/4 x 14 inches, with fastener to match mounting channel.

M. Cable Supports: Porcelain clamps and saddles.

N. Manhole Steps: Polypropylene plastic manhole step with 1/2-inch steel reinforcement.

2.03 CAST-IN-PLACE MANHOLE ACCESSORIES

A. Frames and Covers: ASTM A48/A48M; Class 30B gray cast iron, 27 inch size, machine finished with flat bearing surfaces. Provide cover marked ELECTRIC to indicate utility.

B. Cable Pulling Irons: Use galvanized rod and hardware.

C. Cable Rack Inserts: Minimum load rating of 800 pounds.

D. Cable Rack Mounting Channel: 1-1/2 x 3/4 inch steel channel, 48 inch length. Provide cable rack arm mounting slots on 1-1/2 inch centers.

E. Cable Racks: Steel channel, 1-1/2 x 3/4 x 14 inches, with fastener to match mounting channel.

F. Cable Supports: Porcelain clamps and saddles.

G. Manhole Steps: Polypropylene plastic manhole step with 1/2-inch steel reinforcement.

2.04 ACCESSORIES

A. Adhesive for HDPE Conduit and RTRC:
   1. Specifically designed for bonding dissimilar materials in lieu of transition fittings, including but not limited to polyethylene, fiberglass, PVC, aluminum, and steel; UL 746C recognized.
   2. Approved by adhesive manufacturer for use with materials to be joined.

B. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for the conduit/duct arrangement to be installed.

C. Bore Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for installation within casing; furnished with roller wheels to facilitate installation, openings to facilitate grout flow, and holes for stabilization cable; suitable for the casing and conduit/duct arrangement to be installed.

D. Underground Warning Tape: Polyethylene tape suitable for direct burial.
   1. Legend: Type of service, continuously repeated over full length of tape.
   2. Color:

2.05 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Precast Manholes: Inspect in accordance with ASTM C1037.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify routing and termination locations of duct bank prior to excavation for rough-in.

C. Verify locations of manholes prior to excavating for installation.

D. Duct bank routing is shown in approximate locations unless dimensions are indicated. Route as required to complete duct system.

E. Manhole locations are shown in approximate locations unless dimensions are indicated. Locate as required to complete ductbank system.

3.02 DUCT BANK INSTALLATION

A. Install duct to locate top of ductbank at depths as indicated on drawings.

B. Install duct with minimum slope of 4 inches per 100 feet (0.33 percent). Slope duct away from building entrances.

C. Cut duct square using saw or pipe cutter; de-burr cut ends.

D. Insert duct to shoulder of fittings; fasten securely.

E. Join nonmetallic duct using adhesive as recommended by manufacturer.

F. Wipe nonmetallic duct dry and clean before joining. Apply full even coat of adhesive to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

G. Install no more than equivalent of three 90-degree bends between pull points.

H. Provide suitable fittings to accommodate expansion and deflection where required.

I. Terminate duct at manhole entries using end bell.

J. Stagger duct joints vertically in concrete encasement 6 inches minimum.

K. Use suitable separators and chairs installed not greater than 4 feet on centers.

L. Band ducts together before backfilling.

M. Securely anchor duct to prevent movement during concrete placement.

N. Place concrete under provisions of Section 03 30 00. Use mineral pigment to color concrete red.

O. Provide minimum 3 inch concrete cover at bottom, top, and sides of ductbank.

P. Provide two No. 4 steel reinforcing bars in top of bank under paved areas.

Q. Provide suitable pull string in each empty duct except sleeves and nipples.

R. Swab duct. Use suitable caps to protect installed duct against entrance of dirt and moisture.

3.03 PRE-CAST MANHOLE INSTALLATION

A. Install and seal precast sections in accordance with ASTM C891.

B. Install manholes plumb.

C. Use precast neck and shaft sections to bring manhole cover to finished elevation.

D. Attach cable racks to inserts after manhole installation is complete.

3.04 CAST-IN-PLACE MANHOLE INSTALLATION

A. Formwork: Form inside and outside manhole surfaces in accordance with provisions of Section 03 10 00.

B. Reinforcing: Install reinforcing under the provisions of Section 03 20 00.

C. Concrete: Provide air-entrained, 2000 psi compressive strength at 28 days under the provisions of Section 03 30 00.

D. Shape: Square.

E. Base: Include 14 inch drain opening and two 1 inch ground rod openings. Slope to drain at 0.25 inch per foot (2 percent).

F. Top: Include 39 inch diameter opening; cast 1/2 inch rod in opening to accept ladder hook.

G. Duct Entry: Cast duct openings in walls as indicated.

H. Cable Pulling Irons: Locate opposite each duct entry.

END OF SECTION