

PROJECT MANUAL

FOR

WILMINGTON CAMPUS RENOVATIONS

RED CLAY CONSOLIDATED SCHOOL DISTRICT
1502 SPRUCE AVENUE
WILMINGTON, DELAWARE 19805

OWNER

ABHA ARCHITECTS
1621 N. LINCOLN STREET
WILMINGTON, DELAWARE 19806
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STRUCTURAL ENGINEERS

FURLOW ASSOCIATES
1206 SOCIETY DRIVE
CLAYMONT, DE 19703
(302) 798-3515, FAX (302) 798-9799

**MECHANICAL/ELECTRICAL AND
PLUMBING ENGINEERS**

BID PACK B

ABHA PROJECT NUMBER: 1219

DATE: MAY 28, 2013



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SECTION 000115 LIST OF DRAWINGS

DRWG NO.	DRAWING NAME	BID PACKS	ISSUE DATE	LATEST REV. DATE
G-001	COVER SHEET, LOCATION PLAN & DRAWING LIST	A	04-15-13	
S-101	STRUCTURAL NOTES, ROOF FRAMING PLAN & DETAILS	A	04-15-13	
A-101	FIRST FLOOR PLAN	A	04-15-13	
A-102	SECOND FLOOR PLAN	A	04-15-13	
A-103	THIRD FLOOR PLAN	A	04-15-13	
A-104	ROOF PLAN	A	04-15-13	
A-411	TOILET ROOM PLANS & ELEVATIONS	A	04-15-13	
A-412	TOILET ROOM FINISH PLANS, ELEVATIONS & FINISH SCHEDULE	A	04-15-13	
A-421	ELEVATOR PLANS, ELEVATIONS & DETAILS	A	04-15-13	
A-431	POOLPACK & LOBBY DETAILS	A	04-15-13	
FP-100	FIRE PROTECTION RISER DIAGRAM/SECTIONS/DETAILS	A	04-15-13	
FP-111	FIRST FLOOR FIRE PROTECTION	A	04-15-13	
FP-112	MEZZANINE FIRE PROTECTION	A	04-15-13	
FP-113	ALTERNATES FIRE PROTECTION	A	04-15-13	
FP/P-101	FIRST FLOOR FIRE PROTECTION & PLUMBING	A	04-15-13	
FP/P-102	SECOND FLOOR FIRE PROTECTION & PLUMBING	A	04-15-13	
FP/P-103	THIRD FLOOR FIRE PROTECTION & PLUMBING		04-15-13	
P-100	PLUMBING & FIRE PROTECITON LEGEND/SYMBOLS NOTES & SCHEDULES	A	04-15-13	
P-101	FIRST & SECOND FLOOR DEMOLITION & NEW WORK PLUMBING	A	04-15-13	
M-100	MECHANICAL LEGEND & ABBREVIATIONS	A	04-15-13	
M-101	MECHANICAL SCHEDULES & DETAILS	A	04-15-13	
MP-100	SECOND FLOOR, THIRD FLOOR & PENTHOUSE PLANS DEMOLITION & NEW WORK MECHANICAL / PLUMBING	A	04-15-13	
E-101	FIRST & SECOND FLOOR ELECTRICAL	A	04-15-13	
E-102	THIRD FLOOR & PENTHOUSE ELECTRICAL	A	04-15-13	
E-201	FIRST FLOOR ELECTRICAL	A	04-15-13	
E-202	SECOND FLOOR ELECTRICAL	A	04-15-13	
E-203	THIRD FLOOR ELECTRICAL	A	04-15-13	

SECTION 000115 LIST OF DRAWINGS

DRWG NO.	DRAWING NAME	BID PACKS	ISSUE DATE	LATEST REV. DATE
	EXISTING LIFE SAFETY REFERENCE DRAWINGS			
A1.202	FIRST FLOOR LIFE SAFETY PLAN	A	10/10/07	
A1.203	SECOND FLOOR LIFE SAFETY PLAN	A	10/10/07	
A1.204	THIRD FLOOR LIFE SAFETY PLAN	A	10/10/07	
	BID PACK B REFERENCE DRAWINGS			
A-111	ARCHITECTURAL SECOND FLOOR PLAN - BASE BID	A	04-15-13	
A-111A	ARCHITECTURAL SECOND FLOOR PLAN - ALTERNATES	A	04-15-13	
A-112	ARCHITECTURAL MEZZANINE - BASE BID	A	04-15-13	
A-112A	ARCHITECTURAL MEZZANINE - ALTERNATES	A	04-15-13	
A-113	ARCHITECTURAL THIRD FLOOR PLAN - BASE BID		04-15-13	
A-121	ARCHITECTURAL SECOND FLOOR REFLECTED CEILING PLAN - BASE BID	A	04-15-13	
A-121A	ARCHITECTURAL SECOND FLOOR	A	04-15-13	
A-122	ARCHITECTURAL MEZZANINE REFLECTED CEILING PLAN - BASE BID	A	04-15-13	
A-122A	ARCHITECTURAL MEZZANINE REFLECTED CEILING PLAN - ALTERNATES	A	04-15-13	
A-301	BUILDING SECTIONS – BASE BID	A	04-15-13	
A-301A	BUILDING SECTIONS - ALTERNATES	A	04-15-13	
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G-001	COVER SHEET	B	05-28-13	
G-101	CODE REVIEW	B	05-28-13	
G-111	CODE REVIEW PLAN - SECOND FLOOR	B	05-28-13	
G-112	CODE REVIEW PLAN - MEZZANINE	B	05-28-13	
G-113	CODE REVIEW PLAN - THIRD FLOOR	B	05-28-13	
S-001	STRUCTURAL NOTES, SCHEDULES & ABBREVIATIONS	B	05-28-13	
S-101	FOUNDATION PLAN	B	05-28-13	
S-102	LOW ROOF/ MEZZANINE/ STADIUM SEATING PLAN	B	05-28-13	
S-102A	MEZZANINE FRAMING PLANS - ENLARGED	B	05-28-13	
S-103	LOW ROOF/ MEZZANINE/ CATWALK FRAMING PLAN	B	05-28-13	
S-104	ROOF FRAMING & GRID-IRON FRAMING PLANS	B	05-28-13	
S-105	SECTIONS	B	05-28-13	
S-106	SECTIONS	B	05-28-13	
S-107	SECTIONS	B	05-28-13	
S-108	SECTIONS	B	05-28-13	

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S-109	SECTIONS	B	05-28-13	
A-001	GENERAL NOTES, SYMBOLS, & ABBREVIATIONS	B	05-28-13	
A-002	PARTITION SCHEDULE	B	05-28-13	
A-101	SECOND FLOOR DEMOLITION PLAN	B	05-28-13	
A-102	MEZZANINE DEMOLITION PLAN	B	05-28-13	
A-103	THIRD FLOOR DEMOLITION PLAN	B	05-28-13	
A-104	ROOF DEMOLITION PLAN	B	05-28-13	
A-111	SECOND FLOOR PLAN	B	05-28-13	
A-112	MEZZANINE	B	05-28-13	
A-113	THIRD FLOOR PLAN	B	05-28-13	
A-114	ROOF PLAN	B	05-28-13	
A-121	SECOND FLOOR REFLECTED CEILING PLAN	B	05-28-13	
A-122	MEZZANINE REFLECTED CEILING PLAN	B	05-28-13	
A-201	BUILDING ELEVATIONS	B	05-28-13	
A-301	BUILDING SECTIONS	B	05-28-13	
A-311	WALL SECTIONS	B	05-28-13	
A-312	VESTIBULE 236 ENLARGED PLANS & WALL SECTION	B	05-28-13	
A-313	VESTIBULE 237 ENLARGED PLANS & WALL SECTION	B	05-28-13	
A-401	ENLARGE DRESSING ROOM PLANS, ELEVATIONS AND DETAILS	B	05-28-13	
A-402	ENLARGED TICKET BOOTH PLANS	B	05-28-13	
A-403	ENLARGED PLANS, SECTIONS AND DETAILS - TIERED SEATING	B	05-28-13	
A-404	DECORATIVE PROSCENIUM DETAILS	B	05-28-13	
A-405	ENLARGED PLAN - ORCHESTRA PIT	B	05-28-13	
A-406	SPIRAL STAIR PLANS & DETAILS	B	05-28-13	
A-407	LOBBY CASEWORK	B	05-28-13	
A-501	ACOUSTICAL PANEL DETAILS	B	05-28-13	
A-502	SOFFIT DETAILS	B	05-28-13	
A-503	CASEWORK / LOCKER ELEVATIONS & DETAILS	B	05-28-13	
A-506	ROOFING DETAILS	B	05-28-13	
A-507	GRID IRON & CATWALK DETAILS	B	05-28-13	
A-508	REMOVABLE PIT RAILING	B	05-28-13	
A-601	DOOR SCHEDULE & DETAILS	B	05-28-13	
A-602	DOOR DETAILS	B	05-28-13	
I-111	INTERIOR SECOND FLOOR FINISH PLAN - BASE BID	B	05-28-13	
I-112	INTERIOR MEZZANINE FINISH PLAN - BASE BID	B	05-28-13	
I-121	INTERIOR SECOND FLOOR PLAN - FURINTURE LAYOUT	B	05-28-13	
M-100	MECHANICAL LEGEND & ABBREVIATIONS	B	05-28-13	
M-101	SECOND FLOOR MECHANICAL DEMOLITION	B	05-28-13	
M-102	MEZZANINE MECHANICAL DEMOLITION	B	05-28-13	
M-103	CATWALK & ROOF MECHANICAL DEMOLITION	B	05-28-13	
M-111	SECOND FLOOR MECHANICAL PLANS	B	05-28-13	
M-112	MEZZANINE MECHANICAL PLANS	B	05-28-13	
M-113	CATWALKS & ROOF MECHANICAL PLANS	B	05-28-13	
M-201	MECHANICAL DETAILS	B	05-28-13	

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M-202	MECHANICAL DETAILS	B	05-28-13	
M-301	MECHANICAL SCHEDULES	B	05-28-13	
P-100	PLUMBING & FIRE PROTECTION LEGEND, NOTES & SCHEDULES	B	05-28-13	
P-101	SECOND FLOOR PLUMBING DEMOLITION	B	05-28-13	
P-111	SECOND FLOOR PLUMBING PLANS	B	05-28-13	
E-100	ELECTRIAL LEGEND AND SCHEDULES	B	05-28-13	
E-101	SECOND FLOOR ELECTRICAL DEMOLITION	B	05-28-13	
E-102	MEZZANINE ELECTRICAL DEMOLITION	B	05-28-13	
E-103	CATWALK ELECTRICAL DEMOLITION	B	05-28-13	
E-111	SECOND FLOOR ELECTRICAL LIGHTING PLANS	B	05-28-13	
E-112	MEZZANINE ELECTRICAL LIGHTING PLANS	B	05-28-13	
E-113	CATWALK ELECTRICAL LIGHTING & POWER PLANS	B	05-28-13	
E-210	FIRST FLOOR POWER PLAN	B	05-28-13	
E-211	SECOND FLOOR POWER PLAN	B	05-28-13	
E-212	MEZZANINE POWER PLANS	B	05-28-13	
E-300	ELECTRICAL DETAILS AND SCHEDULES	B	05-28-13	
TL-100	STAGE LIGHTING LIGHT PLOT	B	05-28-13	
TL-101	STAGE LIGHTING MEZZANINE LEVEL LIGHT PLOT	B	05-28-13	
TL-102	STAGE LIGHTING STAGE LEVEL LIGHT PLOT	B	05-28-13	
TL-103	STAGE LIGHTING ORCHESTRA CEILING LIGHTING	B	05-28-13	
TL-104	STAGE LIGHTING APRON LIGHTING	B	05-28-13	
TL-105	STAGE LIGHTING SYSTEM ONE LINE	B	05-28-13	
TL-106	STAGE LIGHTING DISTRIBUTION DETAILS #1	B	05-28-13	
TL-107	STAGE LIGHTING DISTRIBUTION DETAILS #2	B	05-28-13	
TL-108	STAGE LIGHTING CONTROL CONDUIT RISER	B	05-28-13	
TL-109	STAGE LIGHTING CIRCUIT DISTRIBUTION	B	05-28-13	
TL-110	STAGE LIGHTING THIRD FLOOR DEVICE LOCATION PLAN	B	05-28-13	
TL-111	STAGE LIGHTING SECOND FLOOR DEVICE LOCATION PLAN	B	05-28-13	
TL-112	STAGE LIGHTING ORCHESTRA PIT DEVICE LOCATION PLAN	B	05-28-13	
TS-100	A/V SYSTEM SOUND ONE-LINE DIAGRAM #1	B	05-28-13	
TS-101	A/V SYSTEM SOUND ONE-LINE DIAGRAM #2	B	05-28-13	
TS-102	A/V SYSTEM VIDEO ONE-LINE DIAGRAM #1	B	05-28-13	
TS-103	A/V SYSTEM VIDEO ONE-LINE DIAGRAM #2	B	05-28-13	
TS-104	A/V SYSTEM DETAILS #1	B	05-28-13	
TS-105	A/V SYSTEM DETAILS #2	B	05-28-13	
TS-106	A/V SYSTEM DEVICE LOCATIONS STAGE LEVEL	B	05-28-13	
TS-107	A/V SYSTEM DEVICE LOCATIONS CONTROL BOOTH LEVEL	B	05-28-13	
TS-108	A/V SYSTEM DEVICE LOCATIONS UPPER LEVEL	B	05-28-13	
TS-109	A/V SYSTEM SYMBOL KEY	B	05-28-13	
TS-110	A/V SYSTEM INTERCOM CONDUIT RISER	B	05-28-13	
TS-111	A/V SYSTEM SPEAKER CONDUIT RISER	B	05-28-13	

SECTION 001113 ADVERTISEMENT FOR BID

Receipt of Bids

Public notice is hereby given that sealed bids for the following prime contract will be received for the construction of Wilmington Campus Renovations located at 100 North DuPont Road, Wilmington, Delaware 19807. Bids will be received at the main office of the Cab Calloway School of the Arts, 100 North DuPont Road, Wilmington, Delaware 19807 until 3:30 PM local time on Thursday, June 27, 2013, 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 2 calendar days notice to the Bidders.

Contract:	B-05	Demolition
Contract:	B-06	Concrete
Contract:	B-07	Carpentry & General Works
Contract:	B-08	Masonry
Contract:	B-09	Roofing
Contract:	B-10	Structural Steel & Misc. Metals
Contract:	B-11	Metal Studs and Drywall
Contract:	B-12	Painting
Contract:	B-13	Acoustical Ceilings
Contract:	B-14	Flooring
Contract:	B-15	Stage Rigging
Contract:	B-16	Auditorium Seating
Contract:	B-17	Mechanical & Plumbing - Theater
Contract:	B-18	Electrical, Fire Alarm & Specialty Systems
Contract:	B-19	Testing, Adjusting & Balancing

Prequalification

Bidders for Contract B-08: Masonry must be prequalified on both an annual and supplemental basis and have been assigned a MAXIMUM CONTRACT DOLLAR VALUE of \$200,000 (two hundred thousand dollars) or greater classified as a Masonry trade may submit bids on this project.

Bidders for Contract B-17: Mechanical and Plumbing must be prequalified on both an annual and supplemental basis and have been assigned a MAXIMUM CONTRACT DOLLAR VALUE of \$1,100,000 (one million one hundred thousand dollars) or greater classified as either a Mechanical or Mechanical and Plumbing trade may submit bids on this project.

Bidders for Contract B-18 : Electrical, Fire Alarm & Specialty Systems must be prequalified on both an annual and supplemental basis and have been assigned a MAXIMUM CONTRACT DOLLAR VALUE of \$1,900,000 (one million nine hundred thousand dollars) or greater classified as an Electric Power trade may submit bids on this project.

Please note that all subcontractor categories, to be determined at the pre-bid meeting, do not require prequalification in order to participate in the bidding process.

Contractors must submit applications for annual and supplemental prequalification, for this project, by Friday 07 June 2013. Only those listed contractors prequalified both on an annual and supplemental basis will be allowed to submit bids. Those currently prequalified on an annual basis need only submit their supplemental application. Supplemental applications can be obtained by contacting Vincent Colonna with EDiS Company at 302-421-2884. Completed supplemental prequalification applications shall be mailed to:

EDiS Company
ATTN: Vincent Colonna
Project: Wilmington Campus Renovations, Bid Pack B
110 S. Poplar Street, Suite 400
Wilmington, DE 19801

For information on annual or supplemental prequalification procedures, or to apply for Annual and Supplemental Prequalification, visit the Division of Facilities Management website at <http://dfm.delaware.gov/>

Bidding Document

Documents may be viewed and downloaded at EDiS' FTP site after 05 June 2013. Bidders requesting the log on information may obtain user name and password permission by contacting Jane Reese with EDiS Company at jane.reese@ediscompany.com or 302-421-2980. Each contractor will be required to provide the following information prior to receiving the log on information: company name, contact name, email address, phone number, fax number and postal mailing address.

It is the responsibility of each bidder to review and coordinate all Project Documents. This includes plans, specifications and addendums. Documents may also be examined at the office of the Construction Manager, EDiS Company, 110 S. Poplar Street, Suite 400, Wilmington, Delaware 19801; the Architect, ABHA Architects, 1621 North Lincoln Street, Wilmington, DE 19806; and the office of Delaware Contractors Association, 527 Christiana Stanton Road, Newark, Delaware 19713.

Bid Security

A bid security in the amount of 10% of the bid including all alternates, plus a consent of surety must accompany each bid. Bid Security shall specify the Owner as the obligee. Owner: Red Clay Consolidated School District, 1502 Spruce Avenue, Wilmington, Delaware 19805.

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Pre-Bid Meeting

A pre-bid meeting will be held at the Wilmington Campus, 100 North DuPont Road, Wilmington, Delaware 19807, on 06 June 2013 at 3:30 PM local time. A site visit will be conducted immediately following the pre-bid meeting. **Attendance is Mandatory.**

Questions

Please contact EDiS Company, Vincent Colonna at vcolonna@ediscompany.com or 302-421-2884 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, as described by Delaware Law, must be adhered to where applicable.

The Red Clay Consolidated School District reserves the right to waive irregularities and to reject any and all bids.

END OF SECTION

SECTION 002113 - INSTRUCTIONS TO BIDDERS

1. DEFINITIONS

- 1.1 Bidding Documents include the Contract Documents, Invitation to Bid, Instructions to Bidders, the Proposal Forms, Contract, General Conditions of the Contract, Supplementary Conditions, Specifications, Plans, and any Addenda issued prior to receipt of bids.
- 1.2 All definitions set forth in the General Conditions and the other Contract Documents are applicable to the Bidding Documents.
- 1.3 "Addenda" are written or graphic instruments issued by the Architect/Engineer prior to the receipt of bids which modify or interpret the Bidding Documents, by additions, deletions, clarifications or corrections. Addenda become part of the contract documents upon execution of the agreement.
- 1.4 The term Work is defined in 1.1.3 of the General Conditions.
- 1.5 A "Unit of Work" includes all Work covered by the one or more Sections of the specifications listed under that particular Unit of Work in Section 011100 - SUMMARY OF WORK. A Unit of Work is the smallest portion of the Project for which a separate Bid will be accepted by the Construction Manager. The word "Unit" means "Unit of Work" whenever the context clearly implies "Unit of Work".
- 1.6 A "Bid" is a complete and properly signed proposal to do one or more Units of Work for the sum stipulated therein.
- 1.7 A "Bidder" is one who submits a Bid to the Bidding Agency for the Unit or Units of Work indicated therein.
- 1.8 A substantial amount of specification language constitutes definitions for terms found in other Contract Documents, including drawings, which must be recognized as diagrammatic in nature and not completely descriptive of requirements indicated thereon. Certain terms used in Contract Documents are defined generally in this article. Definitions and explanations to this section are not necessarily either complete or exclusive, but are general for the work to the extent not stated more explicitly in another provision of Contract Documents.
- 1.9 General Requirements (or Conditions) apply to entire work of Contract and, where so indicated, to other elements which are included in the project.
- 1.10 The term "indicated" is a cross reference to details, notes or schedules on the Drawings, to other similar means of recording requirements in the Contract

Documents. Where terms such as “shown”, “noted”, “schedule” and “specified” are used in lieu of “indicate,” it is for purpose of helping to locate cross reference and no limitation of location is intended, except as specifically noted.

- 1.11 Where not otherwise explained, terms such as “directed”, “requested”, “authorized”, “selected”, “approved”, “required”, “accepted” and “permitted” mean “directed by Construction Manager or Architect”, “requested by Construction Manager or Architect”, etc.
- 1.12 Where used in conjunction with Construction Manager’s or Architect’s response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of the term “approved” will be held to limitations of Construction Manager’s and Architect’s responsibilities and duties as specified in General and Supplementary Conditions. In no case will “approval” by Construction Manager or Architect be interpreted as a release of Contractor from responsibilities to fulfill requirements of the Contract Documents.
- 1.13 The “Project Site” is the space available to Contractor for performance of the Work, either exclusively or in conjunction with others performing other work as part of the Project. The extent of project site is shown on the Drawings and may or may not be identical with description of the land upon which project is to be built. The Contractor shall visit the site to verify contract or construction limits.
- 1.14 Except as otherwise defined in greater detail, term “furnish” is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.
- 1.15 Except as otherwise defined in greater detail, term “install” is used to describe operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations as applicable in each instance.
- 1.16 Except as otherwise defined in greater detail, term “provide” means furnish and install, complete and ready for intended use, as applicable in each instance.
- 1.17 An “Installer” is the entity, person or firm, engaged by the Contractor or his subcontractor or sub-subcontractor for the performance of a particular unit of work at the project site, including installation, erection, application and similar required operation. It is a general requirement that such installers be expert in operations they are engaged to perform.
- 1.18 The duties and obligations of the Contract apply to this Contractor (as defined herein) regardless of similar or identical duties or obligations of other Prime Contractors related to the Project. Therefore, even though other Prime Contractors

may have similar, identical or overlapping duties and obligations, each and every duty and obligation set forth in this Contract is enforceable against this Contractor.

2. BIDDER'S REPRESENTATION

2.1 Each Bidder in submitting its bid represents that:

1. It has read and understands the Bidding Documents and its Bid is made in accordance therewith.
2. Contractor has visited the site; familiarized himself with the local conditions under which the work is to be performed; compared the site with drawings and specifications; satisfied himself of the conditions of delivery, handling and storage of materials and all other matters that may be incidental to the Work before submitting his Bid.
3. Its Bid is based upon the materials and equipment described within the Bidding Documents without exceptions.

2.2 EVIDENCE OF REPRESENTATION

1. Submission of a Bid will be considered as evidence of the bidder's representation. No allowance will subsequently be made to the successful contractor by reason of any error omission on his part, due to his neglect in complying with the requirements of this article.

3. BIDDING DOCUMENTS

3.1 ISSUANCE

1. Bidding documents will be available on CD, free of charge, at the Construction Manager's office. It is the responsibility of each Bidder to review and coordinate all Project Documents. This includes plans, specifications and addendums.
2. Bidding Documents will not be issued to subcontractors or other individuals or organizations who will not be contracting directly with the Owner.
3. The complete set of Bidding Documents shall be used in preparing bids; neither the Owner, the Architect nor the Construction Manager assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
4. The Owner, Architect, and the Construction Manager, in making copies of

Bidding Documents available on the above terms, do so only for the purpose of obtaining bids on the Work and do not confer a license or grant for any other use.

3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

1. Bidders shall examine the Bidding Documents carefully and shall promptly notify the Construction Manager of any ambiguity, inconsistency or error which they may discover. No request for adjustment of Contract Time or Sum shall be permitted with regard to any purported ambiguity, inconsistency or error not promptly noticed to the Construction Manager.
2. Bidders requiring clarification or interpretation of the Bidding Documents shall make a written request to the Construction Manager to reach him at least seven days prior to the date of receipt of bids.
3. Any interpretation, correction or change of the Bidding Documents will be made by Addendum. Interpretations, corrections, or changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon such interpretations, corrections, and changes.

3.3 SUBSTITUTIONS

1. Refer to Specification Section 016200 - MATERIAL AND EQUIPMENT.
2. Substitution requests must be made at least seven (7) days prior to the receipt of bids.

3.4 ADDENDA

1. Addenda will be emailed, mailed, faxed or delivered to each person or firm recorded by the Construction Manager as having received a complete set of the Bidding Documents, and will be available for inspection wherever the Bidding Documents are kept available for that purpose.
2. Sub-Bidders, Suppliers, Manufacturers and others wishing to have Addenda mailed free of charge directly to them should address a letter to the Construction Manager requesting a listing on the Addenda mailing list for this Project. Such letter must include no other subject matter, must clearly identify this Project by name, and must indicate, line for line, exactly how the name and address is to be typed on the envelope. Phone requests will not be accepted. The Construction Manager will endeavor, but expressly does not promise, to mail Addenda directly to those who have properly requested. Such mailing list is for this one Project only.

3. Addenda issued during the time of bidding shall be listed on Bid form in the space provided. Failure of a Bidder to receive any Addendum shall not release the Bidder from any obligations under his Bid, provided said addendum was sent by fax or by U.S. Mail to the address furnished by the bidder for transmittal of mail. Faxed Addenda will be confirmed by U. S. Mail.
4. No Addenda will be issued later than three (3) 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.

4. BIDDING PROCEDURE

4.1 FORM AND STYLE OF BIDS

1. Bids shall be submitted in triplicate upon the proposal form included in these specifications, or upon an exact copy of it.
2. The Bidder shall complete all blank spaces on the Bid form.
3. Where indicated on the Bid form, sums shall be expressed in both words and figures. In case of discrepancy between the two, the written amount shall govern.
4. Any interlineation, alteration or erasure of an entry made in a blank space of the form must be initialed by the signer of the Bid. However, no interlineation, alteration or erasure shall be made in the wording printed on the bid form unless the Bidder is instructed by the Bidding Documents to do so. The Bidders shall add no stipulations or qualifications on the Bid form or accompanying the bid form unless permitted by or instructed by the Bidding Documents to do so.
5. All requested quantities, unit prices and alternates shall be included as part of the bid.
6. All signatures shall be in long hand.
7. The Bidder shall include on the Bid Form, within the Base Bid total costs associated with providing both the Labor and Material Payment and Performance Bonds.
8. The Bidder shall affix his seal to the bid form, if organized as a corporation.

4.2 SUBMISSION OF BIDS

1. Bids shall be deposited at the designated location prior to the time and date for receipt of Bids indicated in the Invitation to Bid, or any extension thereof made by Addendum. The time and location of the bid opening may be extended with a minimum of two (2) calendar days notice to the Bidders. Bids received after the time and date for receipt of Bids will be marked "LATE BID" and returned.
2. The Bid Proposal (3 copies) shall be enclosed in a sealed envelope. The envelope shall be addressed to the Owner, and shall be identified with the Project name, the Bidder's name and address and the Unit of Work included in the Bid.
3. If the Bidder submits his Bid by mail, he shall enclose the above described sealed envelope in a separate mailing envelope with the notation "BID ENCLOSED" on the face thereof.
4. Bids shall include a fully executed Bid Bond, Power of Attorney, Non-collusion Statement, Consent of Surety and Subcontractor listing.

4.3 MODIFICATION OR WITHDRAWAL OF BID

1. A Bidder may modify his Bid in writing at any time prior to the time scheduled for receiving Bids, provided such written modification is received by the Construction Manager prior to said time.
2. Unless specifically authorized, faxed bids will not be considered.
3. No Bidder shall modify, withdraw or cancel his Bid or any part thereof for SIXTY (60) days after the time designed for the receipt of Bids, in the Invitation to Bid. Any further extension of the time will be by mutual consent of the Owner and the Contractor.
4. A Bid may be withdrawn up until the time scheduled for receiving the Bids. Such withdrawal shall be in writing.

5. CONSIDERATIONS OF BIDS

5.1 OPENING OF BIDS

1. Bid shall be publicly opened and read aloud.

5.2 REJECTION OF BIDS

1. The Owner, in its sole discretion, shall have the right to reject any or all bids for

any reason or for no reason whatsoever.

5.3 ACCEPTANCE OF BIDS

1. The Owner, in its sole discretion, shall have the right to waive any informality or irregularity in any Bid received.
2. The Owner shall have the right to accept Alternates in any order or combination.

6. SUBCONTRACT INFORMATION

6.1 SUBMISSION OF SUBCONTRACTOR LIST

1. Should the Contractor fail to utilize any or all of the Subcontractors in the Contractor's Bid statement in the performance of the Work on the public bidding, the Contractor shall be penalized in the amount of (project specific amount *). The Agency may determine to deduct payment of the penalty from the Contractor or have the amount paid directly to the Agency. Any penalty amount assessed against the Contractor may be remitted or refunded, in whole or in part, by the Agency awarding the Contract, only if it is established to the satisfaction of the Agency that the Subcontractor in question has defaulted or is no longer engaged in such business. No claim for the remission or refund of any penalty shall be granted unless an application is filed within one year after the liability of the successful Bidder accrues. All penalty amounts assessed and not refunded or remitted to the Contractor shall be reverted to the State.

* one (1) percent of the contract amount not to exceed \$10,000.

2. Upon request of the Construction Manager, the Bidder shall within seven (7) days of the request submit a list of the other subcontractors or other persons or organizations (including those who are to furnish materials or equipment fabricated to a special design) if any, proposed for the various portions of the Work not included in the subcontractors list submitted with the bid.
3. The Bidder will be required to establish to the satisfaction of the Construction Manager the capability and experience of all proposed subcontractors to furnish and perform the work described in the sections of the specifications pertaining to such proposed subcontractor's respective trades.
4. Subcontractors and other persons and organizations proposed by the Bidder and accepted by the Owner must be used on the work for which they were proposed and accepted, and shall not be changed except with the written approval of the Construction Manager.

7. EQUALITY OF EMPLOYMENT OPPORTUNITY ON PUBLIC WORKS

During the performance of this Contract, the Contractor agrees as follows:

- 7.1 The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, sex 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, color, sex 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.
- 7.2 The Contractor will, in all solicitants 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, color sex, or national origin.
- 7.3 The term "Contract for public works" means construction, reconstruction, demolition, alteration and repair work and maintenance work paid for, in whole or in part, with public funds.
- 7.4 The Secretary of the Department of Labor shall be responsible for the administration of this section and shall adopt such rules and regulations and issue such orders as he deems necessary to achieve the purpose thereof, provided that no requirement established hereby shall be in conflict with subchapter 6904 of this title.

8. PREVAILING WAGE REQUIREMENT

- 8.1 Wage Provisions: In accordance with Delaware Code, Title 29, Section 6960, renovation projects whose total cost shall exceed \$15,000 and \$100,000 for new construction, 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.
- 8.2 The prevailing wage shall be the wage paid to a majority of employees performing similar work as reported in the Department's annual prevailing wage survey or in the absence of a majority, the average paid to all employees reported.

- 8.3 The Contractor shall pay all mechanics and labors employed directly upon the site of work, 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.
- 8.4 The scale of the wages to be paid shall be posted by the employer in a prominent and easily accessible place at the site of the work.
- 8.5 Every contract based upon these specifications shall contain a stipulation that certified sworn payroll reports be maintained by every Contractor and Subcontractor performing work upon the site of construction. The Contractor and Subcontractor shall keep and maintain the sworn payroll information for a period of 2 years from the last day of the work week covered by the payroll. A certified copy of these payroll reports shall be made available: 1) Effective June 30, 2007, all Contractors performing work on public work projects are required to furnish sworn payroll records on a weekly basis to the Department of Labor. Specifically, 29 Del. C. § 6960(c) states that "(e)very contract... shall contain a stipulation that sworn payroll information, as required by the Department of Labor, be furnished weekly." Further, that "(t)he 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." Lastly, the failure to submit payroll reports shall be subject to a civil penalty of not less than \$1,000 nor more than \$5,000 for each violation. 29 Del. C. § 6960(e). Sworn payroll information shall consist of a fully completed and notarized report on a form provided upon request by the Department of Labor. See Delaware Prevailing Wage Regulations VII A.2(c)"; 2) upon request by the public or for copies thereof. However, a request by the public must be made through the Department of Labor. The requesting party shall, prior to being provided the records, reimburse the costs of preparation by the Department of Labor in accordance with the Department's copying fee policy. The public shall not be given access to the records at the principal office of the Contractor or Subcontractor; and 3) the certified payroll records shall be on a form provided by the Department of Labor or shall contain the same information as the form provided by the Department and shall be provided within 10 days from receipt of notice requesting the records from the Department of Labor.

9. PERFORMANCE AND PAYMENT BONDS

- 9.1 The Contractor shall be required to furnish bonds covering the faithful performance of the contract and the payment of all obligations arising thereunder with such sureties secured through the Bidder's usual sources as may be agreeable to the parties. The Owner shall be noted as the obligee. The Owner is the Red Clay

Consolidated School District.

9.2 The performance and payment bonds shall each be in an amount equal to 100% of the Contract Sum as adjusted from time to time. The Owner shall be noted as the obligee. The Owner is the Red Clay Consolidated School District.

9.3 TIME OF DELIVERY AND FORM OF BONDS

1. The Bidder shall deliver the required bonds within seven (7) days from receipt of request from the Construction Manager.
2. The performance and payment bonds shall be written in the form found in Section 00600 Bonds.
3. The required bonds shall be by an authorized agent of the bonding company and shall be accompanied by a certified and current copy of the bonding agent's Power of Attorney, indicating the monetary limit of such power. The bonding company shall be licensed to operate in the state which the work is to be performed.

10. EXECUTION OF AGREEMENT

- 10.1 The Agreement will be written on a contract form, stipulated by the Owner, a copy of which is included in the Specifications.
- 10.2 The Bidder shall, within seven (7) days following its presentation, execute the Agreement and return it to the Construction Manager.
- 10.3 The Bidder agrees to commence work within seven (7) days of 1) execution of the Agreement, or 2) receipt of a Letter of Intent to execute the Agreement, or other authorization to proceed, if furnished at an earlier date.
- 10.4 If the successful Bidder fails to execute the required Contract and Bond, as aforesaid, within twenty (20) 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.

11. GENERAL COMMENTS

11.1 JOINT VENTURE AGREEMENTS

In the event of a mandatory pre-bid meeting, representatives of both Joint Ventures

must attend the pre-bid meeting and must be an officer and co-joint venture of the corporations involved.

Each Joint Venture shall be qualified and capable to complete the project with their own forces.

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 Ventures involved.

All required bid bonds, performance bonds, material and labor payment bonds must be executed by both Joint Ventures and be placed in both of their names.

All required insurance certificates shall name both Joint Ventures.

Both Joint Ventures shall sign the bid form and shall submit a valid Delaware Business License Number with their bid or shall state that the process of application for a Delaware Business License has been initiated.

Both Joint Ventures shall include their Federal E. I. Number with the bid.

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

11.2 LICENSE APPLICATION REQUIRED TO BID

A business license application must be initiated prior to or in conjunction with the submission of a bid on competitively bid contracts exceeding \$50,000; or in the case of a subcontractor, prior to the submission of a bid by the general contractor. The license application procedure may be initiated by visiting or calling the Division of Revenue.

11.3 BONDING REQUIREMENTS FOR NON-RESIDENT CONTRACTORS

All non-resident contractors are reminded that they must supply a surety or cash bond to the Division of Revenue equal to six percent (6%) of the total of all contracts exceeding \$20,000 for construction within this state. For Division of Revenue purposes, cash bonds and bank letters of credit issued by financial institutions will be accepted on all contracts.

11.4 CONTRACT AWARD TO NON-RESIDENT CONTRACTORS

Every architect, or professional engineer or contractor or construction manager engaging in the practice of such profession shall furnish the Department of Finance

within 10 days after entering into any contract with a contractor or subcontractor not a resident of this State, a statement of the total value of such contract or contracts together with the names and addresses of the contracting parties.

11.5 STATE LICENSE AND TAX REQUIREMENTS

The Contractor and Subcontractor shall be licensed to do business in the State of Delaware and shall pay all fees and taxes due under State laws. In conformance with Section 2503, Chapter 25, Title 30, Delaware Code, "the Contractor shall furnish the State Tax Department within ten (10) days after award of the Contract, a statement of the total values of each contract and subcontract, together with the names and addresses of the contracting parties. All Contractors are required to submit a copy of their City of Wilmington and New Castle County business license to the Construction Manager.

11.6 RIGHT TO AUDIT RECORDS

The Owner (contracting agency) shall have the right to audit the books and records of a Contractor or any Subcontractor under any Contract or Subcontract to the extent that the books and records relate to the performance of the Contract or Subcontract.

Said books and records shall be maintained by the Contractor for a period of three (3) years from the date of final payment under the Prime Contract and by the Subcontractor for a period of three (3) years from the date of final payment under the Subcontract.

11.7 LIQUIDATED DAMAGES

Contractors shall be held liable for liquidated damages if work is not completed prior to the completion date of each phase. Details regarding liquidated damages can be found in Specification Section 011100-6.33.

11.8 PREQUALIFICATION

Please note that all subcontractor categories do not require prequalification in order to participate in the bidding process.

Bidders for Contract B-08: Masonry must be prequalified on both an annual and supplemental basis and have been assigned a MAXIMUM CONTRACT DOLLAR VALUE of \$200,000 (two hundred thousand dollars) or greater classified as a Masonry trade may submit bids on this project. However, certain other conditions as they relate to Maximum Contract Dollar Value may apply. Please see the full text of

the Prequalification Regulations on our website at <http://dfm.delaware.gov/>.

Bidders for Contract B-17: Mechanical and Plumbing must be prequalified on both an annual and supplemental basis and have been assigned a MAXIMUM CONTRACT DOLLAR VALUE of \$1,100,000 (one million one hundred thousand dollars) or greater classified as either a Mechanical or Mechanical and Plumbing trade may submit bids on this project. However, certain other conditions as they relate to Maximum Contract Dollar Value may apply. Please see the full text of the Prequalification Regulations on our website at <http://dfm.delaware.gov/>.

Bidders for Contract B-18 : Electrical, Fire Alarm & Specialty Systems must be prequalified on both an annual and supplemental basis and have been assigned a MAXIMUM CONTRACT DOLLAR VALUE of \$1,900,000 (one million nine hundred thousand dollars) or greater classified as an Electric Power trade may submit bids on this project. However, certain other conditions as they relate to Maximum Contract Dollar Value may apply. Please see the full text of the Prequalification Regulations on our website at <http://dfm.delaware.gov/>.

General contractors must submit applications for annual and supplemental prequalification, for this project, by Friday 7 June 2013. Only those listed contractors prequalified both on an annual and supplemental basis will be allowed to submit bids. Those currently prequalified on an annual basis need only submit their supplemental application.

For information on annual or supplemental prequalification procedures, or to apply for Annual Prequalification, visit the Division of Facilities Management website at <http://dfm.delaware.gov/> or call (302) 739-5644.

Upon completion of the review of the prequalification information submitted by the contractor or subcontractor, a decision will be made to either approve or deny the prequalification. All contractors or subcontractors seeking prequalification will be notified of the decision, in writing, within five days of such determination. Notice of the determination of this supplemental prequalification shall be made by no less than 14 calendar days before the close of the project bid. Any contractor or subcontractor denied supplemental prequalification may request, in writing, a review of such decision with the Superintendent. This request must occur within five working days of the contractor's or subcontractor's receipt of the notice of denial.

A copy of the Application for Contractor/Subcontractor Supplemental Prequalification follows this section. You must be prequalified under general prequalification in order for the supplemental prequalification to be valid. An applicant may submit applications for both general and supplemental prequalification at the same time (note different addresses below).

Mail completed general prequalification applications to:

Division of Facilities Management
540 S. DuPont Highway, Suite 1
Dover, DE 19901

Mail completed supplemental prequalification applications to:

EDiS Company
ATTN: Vincent Colonna
Project: Wilmington Campus Renovations, Bid Pack "B"
110 S. Poplar St., Suite 400
Wilmington, DE 19801

Any contractor or subcontractor who holds a valid prequalification classification shall report any material changes which could adversely affect the prequalification to the Department within ten days of the material change. This notification should come in the form of a letter on the contractor's or subcontractor's letterhead and be signed by an officer of the organization.

END OF SECTION

**Red Clay Consolidated School District
Major Capital Improvement Program**

Application for Contractor/Subcontractor Supplemental Prequalification

Project: Wilmington Campus Renovations, Bid Pack B

General Information

Submitted by: _____

Address: _____

Principal Office Location if other than that noted above: _____

Phone Number: _____

Fax Number: _____

E-Mail Address: _____

Website Address: _____

Delaware Business License Number: _____

Federal E.I. Number: _____

Experience Modification Rating (EMR): _____

Have there been any material changes in your organization since you last submitted an application for general prequalification? (Changes would include things such as: change in organization name, leadership, claims/suits, suspensions/debarments, bankruptcy filings, change in bonding company or maximum bonding capacity)

No _____ Yes _____ (If yes, please explain in detail below)

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

This qualification statement must be signed by an officer/owner of the company certifying that all information provided is true and correct.

By: _____
(Printed Name)

(Title)

(Authorized Signature)

Date: _____

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONTRACT B-05 DEMOLITION
BID FORM

For Bids Due: _____ To: Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, Delaware 19805

Name of Bidder: _____

Bidder Address: _____

Contact Name: _____ E-Mail Address: _____

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

(Other License Nos.): _____

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 (Bidders must review Section 012300 Alternates for a complete description of alternates)

Alternate No. 1: Add Relocation of Instrumental Classroom Corridor

Add/Deduct _____ (\$ _____)

UNIT PRICES

Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

N/A

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed ten percent (10%).

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.

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: _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>
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1. Demolition	_____	_____
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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 B-05 Demolition have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

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 Red Clay Consolidated School District in the sum of _____
_____ Dollars (\$_____), or percent not to exceed _____
_____ Dollars (\$_____) of amount of bid on Contract No. B-05 Demolition to be paid to the
Red Clay Consolidated School District for the use and benefit of the Red Clay Consolidated 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 bounden Principal who has submitted to the
Red Clay Consolidated 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 Red Clay Consolidated 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
Witness _____	_____ Name of Surety
	_____ Title

CONSENT OF SURETY

DATE _____

To:

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)

END OF SECTION

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONTRACT B-06 CONCRETE
BID FORM

For Bids Due: _____ To: Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, Delaware 19805

Name of Bidder: _____

Bidder Address: _____

Contact Name: _____ E-Mail Address: _____

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

(Other License Nos.): _____

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 (Bidders must review Section 012300 Alternates for a complete description of alternates)

Alternate No. 1: Add Relocation of Instrumental Classroom Corridor

Add/Deduct _____ (\$ _____)

UNIT PRICES

Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

N/A

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed ten percent (10%).

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.

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: _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>
1. Concrete	_____	_____
2. Reinforcing Steel	_____	_____

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 B-06 Concrete have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

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 Red Clay Consolidated School District in the sum of _____
_____ Dollars (\$ _____), or percent not to exceed _____
_____ Dollars (\$ _____) of amount of bid on Contract No. B-06 Concrete to be paid to the
Red Clay Consolidated School District for the use and benefit of the Red Clay Consolidated 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 bounden Principal who has submitted to the
Red Clay Consolidated 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 Red Clay Consolidated 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
Witness _____	_____ Name of Surety
	_____ Title

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONSENT OF SURETY

DATE _____

To:

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)

END OF SECTION

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONTRACT B-07 CARPENTRY & GENERAL WORK
BID FORM

For Bids Due: _____ To: Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, Delaware 19805

Name of Bidder: _____

Bidder Address: _____

Contact Name: _____ E-Mail Address: _____

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

(Other License Nos.): _____

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 (Bidders must review Section 012300 Alternates for a complete description of alternates)

Alternate No. 1: Add Relocation of Instrumental Classroom Corridor

Add/Deduct _____ (\$ _____)

Alternate No. 6: Replace Roofing in Bid Pack 'A' Area

Add/Deduct _____ (\$ _____)

UNIT PRICES N/A

Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed ten percent (10%).

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.

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: _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>
1. Carpentry	_____	_____
2. Furnish Doors, Frames & Hardware	_____	_____
3. Scaffolding	_____	_____
4. Wood Flooring	_____	_____
5. Casework	_____	_____

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 B-07 Carpentry & General Work have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

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 Red Clay Consolidated School District in the sum of _____
_____ Dollars (\$ _____), or percent not to exceed _____
_____ Dollars (\$ _____) of amount of bid on Contract No. B-07 Carpentry & General Work to
be paid to the Red Clay Consolidated School District for the use and benefit of the Red Clay Consolidated 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 bounden Principal who has submitted to the
Red Clay Consolidated 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 Red Clay Consolidated 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
Witness _____	_____ Name of Surety
	_____ Title

CONSENT OF SURETY

DATE _____

To:

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)

END OF SECTION

CONTRACT B-08 MASONRY
BID FORM

For Bids Due: _____ To: Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, Delaware 19805

Name of Bidder: _____

Bidder Address: _____

Contact Name: _____ E-Mail Address: _____

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

(Other License Nos.): _____

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 (Bidders must review Section 012300 Alternates for a complete description of alternates)

Alternate No. 1: Add Relocation of Instrumental Classroom Corridor

Add/Deduct _____ (\$ _____)

Alternate No. 6: Replace Roofing in Bid Pack 'A' Area

Add/Deduct _____ (\$ _____)

UNIT PRICES

Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices: N/A

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed ten percent (10%).

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.

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: _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>
1. Masonry	_____	_____
2. Damp Proofing	_____	_____

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 B-08 Masonry have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

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 Red Clay Consolidated School District in the sum of _____
_____ Dollars (\$ _____), or percent not to exceed _____
_____ Dollars (\$ _____) of amount of bid on Contract No. B-08 Masonry to be paid to the
Red Clay Consolidated School District for the use and benefit of the Red Clay Consolidated 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 bounden Principal who has submitted to the
Red Clay Consolidated 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 Red Clay Consolidated 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
Witness _____	_____ Name of Surety
	_____ Title

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONSENT OF SURETY

DATE _____

To:

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)

END OF SECTION

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONTRACT B-09 ROOFING
BID FORM

For Bids Due: _____ To: Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, Delaware 19805

Name of Bidder: _____

Bidder Address: _____

Contact Name: _____ E-Mail Address: _____

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

(Other License Nos.): _____

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 (Bidders must review Section 012300 Alternates for a complete description of alternates)

Alternate No. 6: Replace Roofing in Bid Pack 'A' Area

Add/Deduct _____ (\$ _____)

UNIT PRICES

Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

N/A

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed ten percent (10%).

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.

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: _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>
1. Roofing	_____	_____

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 B-09 Roofing have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

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 Red Clay Consolidated School District in the sum of _____
_____ Dollars (\$ _____), or percent not to exceed _____
_____ Dollars (\$ _____) of amount of bid on Contract No. B-09 Roofing to be paid to the Red
Clay Consolidated School District for the use and benefit of the Red Clay Consolidated 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 bounden Principal who has submitted to the
Red Clay Consolidated 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 Red Clay Consolidated 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
Witness _____	_____ Name of Surety
	_____ Title

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONSENT OF SURETY

DATE _____

To:

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)

END OF SECTION

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONTRACT B-10 STRUCTURAL STEEL & MISC. METALS
BID FORM

For Bids Due: _____ To: Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, Delaware 19805

Name of Bidder: _____

Bidder Address: _____

Contact Name: _____ E-Mail Address: _____

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

(Other License Nos.): _____

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 (Bidders must review Section 012300 Alternates for a complete description of alternates)

Alternate No. 1: Add Relocation of Instrumental Classroom Corridor

Add/Deduct _____ (\$ _____)

UNIT PRICES

Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

N/A

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed ten percent (10%).

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.

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: _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>
1. Structural Steel	_____	_____
2. Misc. Metals	_____	_____

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 B-10 Structural Steel & Misc. Metals have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER:

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 Red Clay Consolidated School District in the sum of _____
_____ Dollars (\$_____), or percent not to exceed _____
_____ Dollars (\$_____) of amount of bid on Contract No. B-10 Structural Steel & Misc.
Metals to be paid to the Red Clay Consolidated School District for the use and benefit of the Red Clay Consolidated
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 bounden Principal who has submitted to the
Red Clay Consolidated 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 Red Clay Consolidated 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
Witness _____	_____ Name of Surety
	_____ Title

CONSENT OF SURETY

DATE _____

To:

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)

END OF SECTION

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONTRACT B-11 METAL STUDS & DRYWALL
BID FORM

For Bids Due: _____ To: Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, Delaware 19805

Name of Bidder: _____

Bidder Address: _____

Contact Name: _____ E-Mail Address: _____

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

(Other License Nos.): _____

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 (Bidders must review Section 012300 Alternates for a complete description of alternates)

Alternate No. 1: Add Relocation of Instrumental Classroom Corridor

Add/Deduct _____ (\$ _____)

UNIT PRICES

Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

N/A

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed ten percent (10%).

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.

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: _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>
1. Metal Framing	_____	_____
2. Drywall Installation	_____	_____
3. Drywall Finishing	_____	_____

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 B-11 Metal Studs & Drywall have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

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 Red Clay Consolidated School District in the sum of _____
_____ Dollars (\$_____), or percent not to exceed _____
_____ Dollars (\$_____) of amount of bid on Contract No. B-11 Metal Studs & Drywall to be
paid to the Red Clay Consolidated School District for the use and benefit of the Red Clay Consolidated 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 bounden Principal who has submitted to the
Red Clay Consolidated 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 Red Clay Consolidated 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
Witness _____	_____ Name of Surety
	_____ Title

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONSENT OF SURETY

DATE _____

To:

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)

END OF SECTION

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONTRACT B-12 PAINTING
BID FORM

For Bids Due: _____ To: Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, Delaware 19805

Name of Bidder: _____

Bidder Address: _____

Contact Name: _____ E-Mail Address: _____

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

(Other License Nos.): _____

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 (Bidders must review Section 012300 Alternates for a complete description of alternates)

Alternate No. 1: Add Relocation of Instrumental Classroom Corridor

Add/Deduct _____ (\$ _____)

UNIT PRICES

Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

N/A

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed ten percent (10%).

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.

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: _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>
1. Painting	_____	_____

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 B-12 Painting have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

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 Red Clay Consolidated School District in the sum of _____
_____ Dollars (\$ _____), or percent not to exceed _____
_____ Dollars (\$ _____) of amount of bid on Contract No. B-12 Painting to be paid to the Red
Clay Consolidated School District for the use and benefit of the Red Clay Consolidated 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 bounden Principal who has submitted to the
Red Clay Consolidated 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 Red Clay Consolidated 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
Witness _____	_____ Name of Surety
	_____ Title

CONSENT OF SURETY

DATE _____

To:

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)

END OF SECTION

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONTRACT B-13 ACOUSTICAL CEILINGS
BID FORM

For Bids Due: _____ To: Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, Delaware 19805

Name of Bidder: _____

Bidder Address: _____

Contact Name: _____ E-Mail Address: _____

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

(Other License Nos.): _____

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 (Bidders must review Section 012300 Alternates for a complete description of alternates)

Alternate No. 1: Add Relocation of Instrumental Classroom Corridor

Add/Deduct _____ (\$ _____)

UNIT PRICES

Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

N/A

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed ten percent (10%).

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.

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: _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>
1. Acoustical Ceilings	_____	_____
2. Acoustical Panels	_____	_____
3. Acoustical Wood Panels	_____	_____

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 B-13 Acoustical Ceilings have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER:

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 Red Clay Consolidated School District in the sum of _____
_____ Dollars (\$ _____), or percent not to exceed _____
_____ Dollars (\$ _____) of amount of bid on Contract No. B-13 Acoustical Ceilings to be paid
to the Red Clay Consolidated School District for the use and benefit of the Red Clay Consolidated 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 bounden Principal who has submitted to the
Red Clay Consolidated 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 Red Clay Consolidated 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
Witness _____	_____ Name of Surety
	_____ Title

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONSENT OF SURETY

DATE _____

To:

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)

END OF SECTION

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONTRACT B-14 FLOORING
BID FORM

For Bids Due: _____ To: Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, Delaware 19805

Name of Bidder: _____

Bidder Address: _____

Contact Name: _____ E-Mail Address: _____

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

(Other License Nos.): _____

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 (Bidders must review Section 012300 Alternates for a complete description of alternates)

Alternate No. 1: Add Relocation of Instrumental Classroom Corridor

Add/Deduct _____ (\$ _____)

UNIT PRICES

Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

N/A

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed ten percent (10%).

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.

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: _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>
1. Carpet	_____	_____
2. VCT	_____	_____
3. Ceramic Tile	_____	_____
4. Resilient Flooring	_____	_____

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 B-14 Flooring have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

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 Red Clay Consolidated School District in the sum of _____
_____ Dollars (\$ _____), or percent not to exceed _____
_____ Dollars (\$ _____) of amount of bid on Contract No. B-14 Flooring to be paid to the Red
Clay Consolidated School District for the use and benefit of the Red Clay Consolidated 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 bounden Principal who has submitted to the
Red Clay Consolidated 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 Red Clay Consolidated 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
Witness _____	_____ Name of Surety
	_____ Title

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONSENT OF SURETY

DATE _____

To:

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)

END OF SECTION

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONTRACT B-15 STAGE RIGGING
BID FORM

For Bids Due: _____ To: Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, Delaware 19805

Name of Bidder: _____

Bidder Address: _____

Contact Name: _____ E-Mail Address: _____

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

(Other License Nos.): _____

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 (Bidders must review Section 012300 Alternates for a complete description of alternates)

Alternate No. 4: Upgrade to Seamless Plastic (PVC) Cyclorama

Add/Deduct _____ (\$ _____)

Alternate No. 5: Add Acoustical Banners.

Add/Deduct _____ (\$ _____)

UNIT PRICES

Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

N/A

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed ten percent (10%).

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.

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: _____

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

Witness: _____ By: _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

ATTACHMENTS

- Sub-Contractor List
- Non-Collusion Statement
- Bid Bond
- Consent of Surety
- (Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>
1. Stage Rigging	_____	_____
2. Stage Curtains	_____	_____
3. Acoustical Shell System	_____	_____
4. Orchestra Pit Filler System	_____	_____

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 B-15 Stage Rigging have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

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 Red Clay Consolidated School District in the sum of _____
_____ Dollars (\$ _____), or percent not to exceed _____
_____ Dollars (\$ _____) of amount of bid on Contract No. B-15 Stage Rigging to be paid to
the Red Clay Consolidated School District for the use and benefit of the Red Clay Consolidated 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 bounden Principal who has submitted to the
Red Clay Consolidated 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 Red Clay Consolidated 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

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONSENT OF SURETY

DATE _____

To:

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)

END OF SECTION

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONTRACT B-16 AUDITORIUM SEATING
BID FORM

For Bids Due: _____ To: Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, Delaware 19805

Name of Bidder: _____

Bidder Address: _____

Contact Name: _____ E-Mail Address: _____

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

(Other License Nos.): _____

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 (Bidders must review Section 012300 Alternates for a complete description of alternates)

N/A

UNIT PRICES

Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

N/A

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed ten percent (10%).

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.

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: _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>
1. Auditorium Seating Installer	_____	_____

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 B-16 Auditorium Seating have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

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 Red Clay Consolidated School District in the sum of _____
_____ Dollars (\$_____), or percent not to exceed _____
_____ Dollars (\$_____) of amount of bid on Contract No. B-16 Auditorium Seating to be
paid to the Red Clay Consolidated School District for the use and benefit of the Red Clay Consolidated 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 bounden Principal who has submitted to the
Red Clay Consolidated 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 Red Clay Consolidated 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

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONSENT OF SURETY

DATE _____

To:

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)

END OF SECTION

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONTRACT B-17 MECHANICAL & PLUMBING - THEATER
BID FORM

For Bids Due: _____ To: Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, Delaware 19805

Name of Bidder: _____

Bidder Address: _____

Contact Name: _____ E-Mail Address: _____

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

(Other License Nos.): _____

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 (Bidders must review Section 012300 Alternates for a complete description of alternates)

Alternate No. 1: Add Relocation of Instrumental Classroom Corridor

Add/Deduct _____ (\$ _____)

Alternate No. 6: Replace Roofing in Bid Pack 'A' Area

Add/Deduct _____ (\$ _____)

UNIT PRICES

Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices: N/A

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed ten percent (10%).

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.

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: _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>
1. Mechanical	_____	_____
2. Plumbing	_____	_____
3. Sheet Metal	_____	_____
4. Insulation	_____	_____

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 B-17 Mechanical & Plumbing - Theater have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

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 Red Clay Consolidated School District in the sum of _____
_____ Dollars (\$ _____), or percent not to exceed _____
_____ Dollars (\$ _____) of amount of bid on Contract No. B-17 Mechanical & Plumbing -
Theater to be paid to the Red Clay Consolidated School District for the use and benefit of the Red Clay Consolidated
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 bounden Principal who has submitted to the
Red Clay Consolidated 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 Red Clay Consolidated 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

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONSENT OF SURETY

DATE _____

To:

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)

END OF SECTION

CONTRACT B-18 ELECTRICAL, FIRE ALARM & SPECIALTY SYSTEMS
BID FORM

For Bids Due: _____ To: Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, Delaware 19805

Name of Bidder: _____

Bidder Address: _____

Contact Name: _____ E-Mail Address: _____

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

(Other License Nos.): _____

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 (Bidders must review Section 012300 Alternates for a complete description of alternates)

Alternate No. 1: Add Relocation of Instrumental Classroom Corridor

Add/Deduct _____ (\$ _____)

Alternate No. 2: Add (6) Additional Intelligent Light Fixtures.

Add/Deduct _____ (\$ _____)

Alternate No. 3: Add LED Ground Row Cyclorama Fixtures.

Add/Deduct _____ (\$ _____)

UNIT PRICES

Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

N/A

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed ten percent (10%).

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.

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: _____

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

Witness: _____ By: _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

ATTACHMENTS

- Sub-Contractor List
- Non-Collusion Statement
- Bid Bond
- Consent of Surety
- (Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>
1. Electrical	_____	_____
2. Fire Alarm Vendor	_____	_____
3. A/V Systems Vendor	_____	_____
4. Theater Lighting Vendor	_____	_____

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 B-18 Electrical, Fire Alarm & Specialty Systems have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

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 Red Clay Consolidated School District in the sum of _____
_____ Dollars (\$ _____), or percent not to exceed _____
_____ Dollars (\$ _____) of amount of bid on Contract No. B-18 Electrical, Fire Alarm &
Specialty Systems to be paid to the Red Clay Consolidated School District for the use and benefit of the Red Clay
Consolidated 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 bounden Principal who has submitted to the
Red Clay Consolidated 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 Red Clay Consolidated 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
Witness _____	_____ Name of Surety
	_____ Title

CONSENT OF SURETY

DATE _____

To:

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)

END OF SECTION

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONTRACT B-19 TESTING, ADJUSTING & BALANCING
BID FORM

For Bids Due: _____ To: Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, Delaware 19805

Name of Bidder: _____

Bidder Address: _____

Contact Name: _____ E-Mail Address: _____

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

(Other License Nos.): _____

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 (Bidders must review Section 012300 Alternates for a complete description of alternates)

N/A

UNIT PRICES

Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

N/A

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

NOTE: The difference in price between Add and Deduct in the above Unit Prices should not exceed ten percent (10%).

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.

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: _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Bond
Consent of Surety
(Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>
1. Testing & Balancing	_____	_____

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 B-19 Testing, Adjusting & Balancing have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER:

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 Red Clay Consolidated School District in the sum of _____
_____ Dollars (\$_____), or percent not to exceed _____
_____ Dollars (\$_____) of amount of bid on Contract No. B-19 Testing, Adjusting &
Balancing to be paid to the Red Clay Consolidated School District for the use and benefit of the Red Clay Consolidated
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 bounden Principal who has submitted to the
Red Clay Consolidated 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 Red Clay Consolidated 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
Witness _____	_____ Name of Surety
	_____ Title

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

CONSENT OF SURETY

DATE _____

To:

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)

END OF SECTION

SECTION 005200 - AGREEMENT

1. SUMMARY

1.1. The Agreement Form for this Project is either the American Institute of Architects Standard Form of Agreement between Owner and Contractor, Construction Manager as Advisor, AIA Document A132 - 2009 Edition

1.2 A copy of AIA Document A132 – 2009 Edition is bound into this Project Manual following this page.

1.2.1 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

AIA[®] Document A132[™] – 2009

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)

Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, DE 19805

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

Wilmington Campus Renovations
100 North DuPont Road
Wilmington, DE 19801

The Construction Manager:
(Name, legal status, address and other information)

EDiS Company
110 South Poplar Street, Suite 400
Wilmington, DE 19801

The Architect:
(Name, legal status, address and other information)

ABHA Architects
1621 North Lincoln Street
Wilmington, DE 19806

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. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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[™]–2009, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition; B132[™]–2009, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132[™]–2009, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

AIA Document A232[™]–2009 is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

TABLE OF ARTICLES

- 1 THE CONTRACT DOCUMENTS
- 2 THE WORK OF THIS CONTRACT
- 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
- 4 CONTRACT SUM
- 5 PAYMENTS
- 6 DISPUTE RESOLUTION
- 7 TERMINATION OR SUSPENSION
- 8 MISCELLANEOUS PROVISIONS
- 9 ENUMERATION OF CONTRACT DOCUMENTS
- 10 INSURANCE AND BONDS

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 SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner.

(Insert the date of commencement, if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)

If, prior to the commencement of the Work, the Owner requires time to file mortgages, mechanics' liens and other security interests, the Owner's time requirement shall be as follows:

§ 3.2 The Contract Time shall be measured from the date of commencement.

§ 3.3 The Contractor shall achieve Substantial Completion of the entire Work not later than () days from the date of commencement, or as follows:

(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. If appropriate, insert requirements for earlier Substantial Completion of certain portions of the Work.)

init.

Portion of the Work

Substantial Completion Date

, subject to adjustments of this Contract Time as provided in the Contract Documents.
(Insert provisions, if any, for liquidated damages relating to failure to achieve Substantial Completion on time or for bonus payments for early completion of the Work.)

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 without a Guaranteed Maximum Price, 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. Based on the selection above, also complete either Section 5.1.4, 5.1.5 or 5.1.6 below.)

§ 4.2 Stipulated Sum

§ 4.2.1 The Stipulated Sum shall be (\$), subject to additions and deletions as provided in the Contract Documents.

§ 4.2.2 The Stipulated Sum is based on the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:

(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

§ 4.2.3 Unit prices, if any:

(Identify and state the unit price, and state the quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit (\$0.00)
------	-----------------------	-------------------------

§ 4.2.4 Allowances included in the Stipulated Sum, if any:

(Identify allowance and state exclusions, if any, from the allowance price.)

Item	Allowance
------	-----------

§ 4.3 Cost of the Work Plus Contractor's Fee without a Guaranteed Maximum Price

§ 4.3.1 The Contract Sum is the Cost of the Work as defined in Exhibit A, Determination of the Cost of the Work, plus the Contractor's Fee.

§ 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 rate paid at the place of the Project.

§ 4.3.6 Unit prices, if any:
 (Identify and state the unit price; state 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 for the Owner, in writing, a Control Estimate within 14 days of executing this Agreement. The Control Estimate shall include the items in Section A.1 of Exhibit A, 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 Contract Sum is the Cost of the Work as defined in Exhibit A, Determination of the Cost of the Work, plus the Contractor's Fee.

§ 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:

§ 4.4.5 Rental rates for Contractor-owned equipment shall not exceed percent (%) of the standard rate paid at the place of the Project.

§ 4.4.6 Unit Prices, if any:
 (Identify and state the unit price, and state the 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 sum of the Cost of the Work and the Contractor's Fee is guaranteed by the Contractor not to exceed (\$), subject to additions and deductions by changes in the Work as provided in the Contract Documents. Such 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.
 (Insert specific provisions if the Contractor is to participate in any savings.)

Init.

§ 4.4.7.2 The Guaranteed Maximum Price is based on the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:

§ 4.4.7.3 Allowances included in the Guaranteed Maximum Price, if any:
(Identify and state the amounts of any allowances, and state whether they include labor, materials, or both.)

Item	Allowance
------	-----------

§ 4.4.7.4 Assumptions, if any, on which the Guaranteed Maximum Price is based:

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Construction Manager by the Contractor, and upon certification of the Project Application and Project Certificate for Payment or Application for Payment and Certificate for Payment by the Construction Manager and Architect and issuance by the 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 certified amount in the Application for Payment 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 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 and be prepared in such form and supported by such data to substantiate its accuracy as the Construction Manager and Architect may require. 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.

§ 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 Subject to the provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

- 1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the total Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of percent (%). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute may be included as provided in Section 7.3.9 of the General Conditions;
- 2 Add 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), less retainage of percent (%);
- 3 Subtract the aggregate of previous payments made by the Owner; and

- .4 Subtract amounts, if any, for which the Construction Manager or Architect has withheld or nullified a Certificate for Payment as provided in Section 9.5 of the General Conditions.

§ 5.1.4.4 The progress payment amount determined in accordance with Section 5.1.4.3 shall be further modified under the following circumstances:

- .1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to percent (%) of the Contract Sum, less such amounts as the Construction Manager recommends and the Architect determines for incomplete Work and unsettled claims; and
- .2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 9.10.3 of the General Conditions.

§ 5.1.4.5 Reduction or limitation of retainage, if any, shall be as follows:

(If it is intended, prior to Substantial Completion of the entire Work, to reduce or limit the retainage resulting from the percentages inserted in Sections 5.1.4.3.1 and 5.1.4.3.2 above, and this is not explained elsewhere in the Contract Documents, insert here provisions for such reduction or limitation.)

§ 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 A, 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 cash disbursements already made by the Contractor on account of the Cost of the Work equal or exceed (1) progress payments already received by the Contractor; less (2) that portion of those payments attributable to the Contractor's Fee; plus (3) payrolls for the period covered by the present Application for Payment.

§ 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 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

- .1 Take the Cost of the Work as described in Exhibit A, Determination of the Cost of the Work;
- .2 Add the Contractor's Fee, less retainage of percent (%). The Contractor's Fee shall be computed upon the Cost of the Work described in that Section at the rate stated in that Section; or if the Contractor's Fee is stated as a fixed sum, an amount which bears the same ratio to that fixed-sum Fee as the Cost of the Work bears to a reasonable estimate of the probable Cost of the Work upon its completion;
- .3 Subtract retainage of percent (%) from that portion of the Work that the Contractor self-performs;
- .4 Subtract the aggregate of previous payments made by the Owner;
- .5 Subtract the shortfall, if any, indicated by the Contractor in the documentation required by Article 5 or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and
- .6 Subtract amounts, if any, for which the Construction Manager or Architect has withheld or withdrawn a Certificate for Payment as provided in Section 9.5 of AIA Document A232™-2009, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition.

§ 5.1.5.4 The Owner, Construction Manager and Contractor shall agree upon (1) a mutually acceptable procedure for review and approval of payments to Subcontractors and (2) 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 shall not be deemed to represent that 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; that the Construction Manager and Architect have made exhaustive or continuous on-site inspections; or 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.

§ 5.1.6 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 or Architect to demonstrate that cash disbursements already made by the Contractor on account of the Cost of the Work equal or exceed (1) progress payments already received by the Contractor; less (2) that portion of those payments attributable to the Contractor's Fee; plus (3) payrolls for the period covered by the present Application for Payment.

§ 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 Contract Sum among the various portions of the Work and be prepared in such form and supported by such data to substantiate its accuracy as the Construction Manager and Architect may require. 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.

§ 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 for which the Contractor has made or intends to make actual 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 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

1. Take 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 schedule of values. Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.10 of AIA Document A232-2009;
2. Add 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 Work, or if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing;
3. Add the Contractor's Fee, less retainage of percent (%). The Contractor's Fee shall be computed upon the Cost of the Work at the rate stated in Section 4.4.2 or, if the Contractor's Fee is stated as a fixed sum in that Section, shall be an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work bears to a reasonable estimate of the probable Cost of the Work upon its completion;
4. Subtract retainage of percent (%) from that portion of the Work that the Contractor self-performs;
5. Subtract the aggregate of previous payments made by the Owner;
6. Subtract 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
7. Subtract amounts, if any, for which the Construction Manager or Architect have withheld or nullified a Certificate for Payment as provided in Section 9.5 of AIA Document A232-2009.

§ 5.1.6.5 The Owner and the Contractor shall agree upon a (1) mutually acceptable procedure for review and approval of payments to Subcontractors and (2) 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 shall not be deemed to represent that 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; that the

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Construction Manager or Architect have made exhaustive or continuous on-site inspections; or 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.

§ 5.2 Final Payment

§ 5.2.1 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 Section 12.2 of AIA Document A232-2009, 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 A, Determination of the Cost of the Work when payment is on the basis of the Cost of the Work, with or without a Guaranteed Maximum payment; and
- .3 a final Certificate for Payment or Project Certificate for Payment has been issued by the Architect; such final payment shall be made by the Owner not more than 30 days after the issuance of the final Certificate for Payment or Project Certificate for Payment, or as follows:

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Section 15.2 of AIA Document A232-2009, 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 Section 15.3 of AIA Document A232-2009, the method of binding dispute resolution shall be as follows:

(Check the appropriate box. If the Owner and Contractor do not select a method of binding dispute resolution below, 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.)

- Arbitration pursuant to Section 15.4 of AIA Document A232-2009.
- Litigation in a court of competent jurisdiction.
- Other: *(Specify)*

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 A232-2009.

§ 7.1.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232-2009.

§ 7.2 Where the Contract Sum is Based on the Cost of the Work with or without a Guaranteed Maximum Price

§ 7.2.1 Subject to the provisions of Section 7.2.2 below, the Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A232-2009.

§ 7.2.2 The Contract may be terminated by the Owner for cause as provided in Article 14 of AIA Document A232-2009; however, the Owner shall then only pay the Contractor an amount calculated 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 Sections 4.3.2 or 4.4.2, as applicable, or, if the Contractor's Fee is stated as a fixed sum, 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; and
- .3 Subtract the aggregate of previous payments made by the Owner.

§ 7.2.3 If the Owner terminates the Contract for cause when the Contract Sum is based on the Cost of the Work with a Guaranteed Maximum Price, and as provided in Article 14 of AIA Document A232-2009, the amount, if any, to be paid to the Contractor under Section 14.2.4 of AIA Document A232-2009 shall not cause the Guaranteed Maximum Price to be exceeded, nor shall it exceed the amount calculated in Section 7.2.2.

§ 7.2.4 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. 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.

§ 7.2.5 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A232-2009; in such case, the Contract Sum and Contract Time shall be increased as provided in Section 14.3.2 of AIA Document A232-2009, except that the term 'profit' shall be understood to mean the Contractor's Fee as described in Sections 4.3.2 and 4.4.2 of this Agreement.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A232-2009 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 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.)

%

§ 8.3 The Owner's representative:
(Name, address and other information)

§ 8.4 The Contractor's representative:
(Name, address and other information)

§ 8.5 Neither the Owner's nor the Contractor's representative shall be changed without ten days written notice to the other party.

§ 8.6 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

§ 9.1.1 The Agreement is this executed AIA Document A132-2009, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition.

§ 9.1.2 The General Conditions are, AIA Document A232-2009, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition.

§ 9.1.3 The Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
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§ 9.1.4 The Specifications:
 (Either list the Specifications here or refer to an exhibit attached to this Agreement.)

Section	Title	Date	Pages
---------	-------	------	-------

§ 9.1.5 The Drawings:
 (Either list the Drawings here or refer to an exhibit attached to this Agreement.)

Number	Title	Date
--------	-------	------

§ 9.1.6 The Addenda, if any:

Number	Date	Pages
--------	------	-------

Portions of Addenda relating to bidding requirements are not part of the Contract Documents unless the bidding requirements are also enumerated in this Article 9.

§ 9.1.7 Additional documents, if any, forming part of the Contract Documents are:

1. AIA Document A132™-2009, Exhibit A, Determination of the Cost of the Work, if applicable.
2. AIA Document E201™-2007, Digital Data Protocol Exhibit, if completed, or the following:

3. AIA Document E202™-2008, Building Information Modeling Protocol Exhibit, if completed, or the following:

- 4 Other documents, if any, listed below:
(List here any additional documents which are intended to form part of the Contract Documents. AIA Document A232-2009 provides that bidding requirements such as advertisement or invitation to bid, Instructions to Bidders, sample forms and the Contractor's bid are not part of the Contract Documents unless enumerated in this Agreement. They should be listed here only if intended to be part of the Contract Documents.)

ARTICLE 10 INSURANCE AND BONDS

The Contractor shall purchase and maintain insurance and provide bonds as set forth in Article 11 of AIA Document A232-2009.

(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A232-2009.)

Type of Insurance or Bond

Limit of Liability or Bond Amount (\$0.00)

This Agreement is entered into as of the day and year first written above.

Red Clay Consolidated School District

OWNER (Signature)

CONTRACTOR (Signature)

(Printed name and title)

(Printed name and title)

Init.

SECTION 006113 – PERFORMANCE AND PAYMENT BONDS

1. PERFORMANCE AND PAYMENT BONDS

1.1 Bonds must be in the following form:

1. Form of Performance Bond (attached).
2. Form of Payment Bond (attached).

SECTION 00 61 13 - 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, Red Clay Consolidated 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 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, 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, 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

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

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.

PRINCIPAL

Name: _____

Witness or Attest: Address: _____

By: _____ (SEAL)

Name: Name:

Title:

(Corporate Seal)

SURETY

Name: _____

Witness or Attest: Address: _____

By: _____ (SEAL)

Name: Name:

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, Red Clay Consolidated 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 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.

PRINCIPAL

Name: _____

Witness or Attest: Address: _____

By: _____ (SEAL)

Name: _____
Name: _____
Title: _____

(Corporate Seal)

SURETY

Name: _____

Witness or Attest: Address: _____

By: _____ (SEAL)

Name: _____
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

1.1 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:

1. Name and Address of Insured (Contractor).
2. Description of Operations/Locations -

3. Added Insured – Red Clay Consolidated School District and EDiS Company

4. Certificate Holder – Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, Delaware 19805

Contractors shall note that although not a part of AIA Document A232 - 2009 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

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YY)
 XX/XX/XX

PRODUCER PRODUCER INSURANCE AGENCY PO BOX PRODUCER STREET ADDRESS PRODUCER CITY, ST PROD ZIP	THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.
INSURER D SAMPLE SUBCONTRACTOR CERTIFICATE (REQUIRED MINIMUM INSURANCE)	INSURERS AFFORDING COVERAGE
	INSURER A: XXXXXX
	INSURED B: XXXXXX
	INSURER C: XXXXXX
	INSURER D:
	INSURER E:

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	DATE (MM/YY)	LIMITS	
	GENERAL LIABILITY <input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY CLAIMS MADE <input type="checkbox"/> OCCUR <input checked="" type="checkbox"/> GENL. AGGREGATE LIMIT APPLIES PER: POLICY <input type="checkbox"/> PROJECT <input checked="" type="checkbox"/> LO C <input type="checkbox"/>	XXXXXXXXXXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	EACH OCCURRENCE	\$ 1,000,000
					FIRE DAMAGE (Any one fire)	\$ 300,000
					MED EXP (Any one person)	\$ 10,000
					PERSONAL & ADV INJURY	\$ 1,000,000
					GENERAL AGGREGATE	\$ 2,000,000
					PRODUCTS - COMP/OP AGG	\$ 2,000,000
	AUTOMOBILE LIABILITY <input checked="" type="checkbox"/> ANY AUTO ALL OWNED AUTOS SCHEDULED AUTOS <input checked="" type="checkbox"/> HIRED AUTOS <input checked="" type="checkbox"/> NON-OWNED AUTOS	XXXXXXXXXXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	COMBINED SINGLE LIMIT (Ea accident)	\$ 1,000,000
					BODILY INJURY (Per person)	\$
					BODILY INJURY (Per accident)	\$
					PROPERTY DAMAGE (Per accident)	\$
	GARAGE LIABILITY <input type="checkbox"/> ANY AUTO				AUTO ONLY - EA ACCIDENT	\$
					OTHER THAN: AUTO ONLY: EA ACC AGG	\$
	EXCESS LIABILITY <input checked="" type="checkbox"/> OCCUR <input type="checkbox"/> CLAIMS MADE DEDUCTIBLE RETENTION \$	XXXXXXXXXXXXXXXXXX	XXXXXXXXXX	XXXXXXX	EACH OCCURRENCE	\$ 5,000,000
					AGGREGATE	\$ 5,000,000
						\$
						\$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY	XXXXXXXXXXXXXXXXXX	XXXXXXXXXX	XXXXXXXXXX	<input checked="" type="checkbox"/> WC STATUTORY LIMITS <input type="checkbox"/> OTH-ER	\$
					E.L. EACH ACCIDENT	\$ 500,000
					E.L. DISEASE - EA EMPLOYEE	\$ 500,000
					E.L. DISEASE - POLICY LIMIT	\$ 500,000
	OTHER					

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/EXCLUSIONS ADDED BY ENDORSEMENT/SPECIAL PROVISIONS
Name of Project: Wilmington Campus Renovations – Red Clay Consolidated School District and EDiS Company shall be named as Additional Insureds for both ongoing and completed operations. The endorsements providing the Additional Insured status for ongoing and completed operations must be attached to the Certificate of Insurance.

CERTIFICATE HOLDER ADDITIONAL INSURED; INSURER LETTER: _____ CANCELLATION

Red Clay Consolidated School District 1502 Spruce Avenue Wilmington, DE 19805	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES. AUTHORIZED REPRESENTATIVE
---	--

SECTION 007200 – GENERAL CONDITIONS

1. SUMMARY

- 1.1. 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 - 2009 Edition.
- 1.2 A copy of AIA Document A232 - 2009 Edition is bound into this Project Manual following this page.

END OF SECTION

AIA[®] Document A232[™] – 2009

General Conditions of the Contract for Construction, Construction Manager as Adviser Edition

for the following PROJECT:

(Name, and location or address)

Wilmington Campus Renovations

THE CONSTRUCTION MANAGER:

(Name, legal status and address)

EDiS Company
110 South Poplar Street, Suite 400
Wilmington, DE 19801

THE OWNER:

(Name, legal status and address)

Red Clay Consolidated School District
1502 Spruce Avenue
Wilmington, DE 19805

THE ARCHITECT:

(Name, legal status and address)

ABHA Architects
1621 North Lincoln Street
Wilmington, DE 19806

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. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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[™]–2009, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132[™]–2009, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132[™]–2009, 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 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 Multiple Prime Contractors and by the Owner's own forces, including persons or entities under separate contracts not administered by the Construction Manager.

§ 1.1.5 **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.

§ 1.1.6 **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.

§ 1.1.7 **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.

§ 1.1.8 **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 and certify termination of the Agreement under Section 14.2.2.

§ 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.

§ 1.2.2 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 will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, sub-subcontractors, and material or equipment 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 this Project is not to be construed as publication in derogation of the Architect, or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them 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 material or equipment suppliers may not use the Instruments of Service 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 the Architect's consultants.

§ 1.6 Transmission of Data in Digital Form

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

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 Article 4, 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 Information and Services Required of the Owner

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the

portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 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, 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, through the Construction Manager, shall secure and pay for the building permit.

§ 2.2.3 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.

§ 2.2.4 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.

§ 2.2.5 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.

§ 2.2.6 The Owner shall endeavor to forward all communications to the Contractor through the Construction Manager and shall contemporaneously provide the same communications to the Architect about matters arising out of or relating to the Contract Documents.

§ 2.3 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.

§ 2.4 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 written 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 deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor 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. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect, after consultation with the Construction Manager. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

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 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 plural term "Multiple Prime Contractors" refers to persons or entities who perform construction under contracts with the Owner that are administered by the Construction Manager. The term does not include the Owner's own forces, including persons or entities under separate contracts not administered by the Construction Manager.

§ 3.1.3 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.4 The Contractor shall not be relieved of 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 2.2.3, 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 make 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 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, unless the Contract Documents give other specific instruction concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and 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 written notice to the Owner, the Construction Manager, and the Architect and shall not proceed with that portion of the Work without further written instructions from the Architect, through the Construction Manager. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 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 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 authorized by the Architect in accordance with Sections 3.12.8 or 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

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 with 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.

§ 3.6 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, through 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 (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 21 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 an equitable adjustment 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 in writing, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either party may proceed 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 furnish in writing to the Owner and Architect through the Construction Manager, the name and qualifications of a proposed superintendent. The Construction Manager may reply within 14 days to the Contractor in writing stating (1) whether the Owner, the Construction Manager, or the Architect has reasonable objection to the proposed superintendent or (2) that any of them require additional time to review. Failure of the Construction Manager to reply 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.

§ 3.10 Contractor's Construction Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information and the Construction Manager's approval a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project schedule to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

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 Multiple Prime Contractors or the construction or operations of the Owner's own forces.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter update it as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Construction Manager's and Architect's approval. The Architect and Construction Manager's approval shall not unreasonably be 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, 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 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 maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These documents shall be available to the Architect 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 the way by which 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 4.2.9 through 4.2.11. 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 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 Multiple Prime 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 Multiple Prime 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

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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 requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Construction Manager and Architect in writing 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 written 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. 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 cause such services or certifications to be provided by a properly 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 and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, 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 Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 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, and 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 and patching shall be restored to the condition existing prior to the cutting, fitting and 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's own forces or of other Multiple Prime Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner's own forces or by other Multiple Prime Contractors except with written consent of the Construction Manager,

Owner and such other Multiple-Prime Contractors; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the other Multiple Prime Contractors or the Owner the Contractor's 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 or 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 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 such 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 the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such 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.

§ 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 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 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.

§ 4.1.2 The Owner shall retain a construction manager lawfully licensed to practice construction management or an entity 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.

§ 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.

§ 4.1.4 If the employment of the Construction Manager or Architect is terminated, the Owner shall employ a successor construction manager or architect as 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.

§ 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 reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner and Construction Manager (1) known deviations from the Contract Documents and from the most recent Project schedule prepared by the Construction Manager, and (2) defects and deficiencies observed in the Work.

§ 4.2.3 The Construction Manager shall provide a staffing plan to include 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 reasonably informed of the progress of the Work, and will report to the Owner and Architect (1) known deviations from the Contract Documents and the most recent Project schedule, and (2) defects and deficiencies observed in the Work.

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Multiple Prime 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, or charge of, 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, except as provided in Section 3.3.1, 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 Facilitating Contract Administration.** Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Construction Manager, and shall contemporaneously provide the same communications to the Architect about matters arising out of or relating to the Contract Documents. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with other Multiple Prime Contractors shall be through the Construction Manager and shall be contemporaneously provided to the Architect if those communications are about matters arising out of or related to the Contract Documents. Communications by and with the Owner's own forces shall be through the Owner.

§ 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. The Construction Manager shall determine in general

whether the Work of the Contractor is being performed in accordance with the requirements of the Contract Documents and notify the Owner, Contractor and Architect of defects and deficiencies in the Work. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require additional inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, upon written authorization of the Owner, whether or not such 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, material and equipment suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 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 Multiple Prime Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from Contractor and other Multiple Prime 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.

§ 4.2.10 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.

§ 4.2.11 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, unless otherwise specifically stated by the Construction Manager and Architect, 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.

§ 4.2.12 The Construction Manager will prepare Change Orders and Construction Change Directives.

§ 4.2.13 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.

§ 4.2.14 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.

§ 4.2.15 The Construction Manager will assist the Architect in conducting inspections to determine the 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

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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.

§ 4.2.16 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 duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.17 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.

§ 4.2.18 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.

§ 4.2.19 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.20 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 to 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 Multiple Prime Contractors or subcontractors of other Multiple Prime 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 or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Construction Manager for review by the Owner, Construction Manager and Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Construction Manager may reply within 14 days to the Contractor in writing stating (1) whether the Owner, the Construction Manager or the Architect has reasonable objection to any such proposed person or entity or, (2) that the Construction Manager, Architect or Owner requires additional time for review. Failure of the Construction Manager, Owner, or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

§ 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 previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate agreement, written where legally required for validity, 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 responsibility for safety of the Subcontractor's Work, which the Contractor, by these 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 in writing; 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 such 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 OTHER 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, which include persons or entities under separate contracts not administered by the Construction Manager, and to award other contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When the Owner performs construction or operations with the Owner's own forces including persons or entities under separate contracts not administered by the Construction Manager, the Owner shall provide for coordination of such forces 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, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor 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, Construction Manager and other Multiple Prime 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 or other Multiple Prime Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Construction Manager and Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's own forces or other Multiple Prime Contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs, including costs that are payable to a separate contractor or to other Multiple Prime 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 or other Multiple Prime Contractors.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner, separate contractors, or other Multiple Prime Contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and other Multiple Prime 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, other Multiple Prime 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.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, 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 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager and Architect 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.

§ 7.3.6 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.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager shall determine the method and 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 7.3.7 shall be limited to the following:

- 1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers compensation insurance;
- .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 related to the Work; and
- .5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 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

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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 has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order issued through the Construction Manager and shall be binding on the Owner and Contractor.

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, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 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 an act or neglect of the Owner, Owner's own forces, Construction Manager, Architect, any of the other Multiple Prime Contractors or an employee of any of them, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration, or by other causes that the Architect, based on the recommendation of the Construction Manager, determines may justify delay, then the Contract Time shall be extended by Change Order 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

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.

§ 9.2 Schedule of Values

Where the Contract is based on a Stipulated Sum or Guaranteed Maximum Price, the Contractor shall submit to the Construction Manager, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Construction Manager and Architect may require. 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. In the event there is one Contractor, the Construction Manager shall forward to the Architect the Contractor's schedule of values. If there are Multiple Prime Contractors responsible for performing different portions of the Project, the Construction Manager shall forward the Multiple Prime Contractors' schedules of values only if requested by the Architect.

§ 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. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner, Construction Manager or Architect may require, such as copies of requisitions from Subcontractors and material 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 material 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 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, material suppliers, or other persons or entities making a claim by reason of having 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 issue to the Owner a Certificate for Payment, with a copy to the Construction Manager, for such amount as the Architect determines is properly due, or notify the Construction Manager and Owner in writing of the Architect's reasons for withholding certification in whole or in part 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 are Multiple Prime Contractors performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives the Multiple Prime Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Multiple Prime Contractors; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Multiple Prime Contractors' application with information from similar applications for progress payments from other Multiple Prime Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Multiple Prime Contractors; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.3 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 issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager, for such amount as the Architect determines is properly due, or notify the Construction Manager and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors.

§ 9.4.4 The Construction Manager's certification of an Application for Payment or, in the case of Multiple Prime Contractors, a Project Application and Certificate for Payment shall be based upon the Construction Manager's evaluation of the Work and the information provided as part of the Application 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 and the quality of the Work is in accordance with the Contract Documents. The certification will also constitute a recommendation to the Architect and Owner that the Contractor be paid the amount certified.

§ 9.4.5 The Architect's issuance of a Certificate for Payment or in the case of Multiple Prime Contractors, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and information provided as part of 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, that the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified.

§ 9.4.6 The representations made pursuant to Sections 9.4.4 and 9.4.5 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.

§ 9.4.7 The issuance of a separate 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 or quantity of the Work, (2) reviewed the Contractor's construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material 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 9.4.4 and 9.4.5 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 9.4.3. 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 or subsequent observations, 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 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;
- .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 the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 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 material or equipment suppliers 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 material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors 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 except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment 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 and 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, shall create any fiduciary

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liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 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' written 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 shut-down, 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 requirements of 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 or designated portion thereof is substantially complete, the Construction Manager will prepare, and the Construction Manager and Architect shall execute a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall 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 such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such 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 as required under Section 11.3.1.5 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 written 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 will evaluate the completion of Work of the Contractor and then forward the notice and Application, with the Construction Manager's recommendations, 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 terms and conditions of 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 and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial 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 and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, 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. If such lien 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 such lien, 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 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 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; or
- .3 terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material 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 or the Contractor's Subcontractors or Sub-subcontractors;
- .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 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 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 owners and users of adjacent sites and utilities.

§ 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, except damage or loss 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, written notice of such 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. 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 report the condition to the Owner, Construction Manager and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify a 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 such material or substance or who are to perform the task of removal or safe containment of such 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 resumed 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 in the amount of the Contractor's reasonable additional costs of shut-down, 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 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 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 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 indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance 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 indemnify 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 Liability Insurance

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set

forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1 Claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;
- .2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 Claims for damages insured by usual personal injury liability coverage;
- .5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle; and
- .7 Claims for bodily injury or property damage arising out of completed operations; and
- .8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be submitted to the Construction Manager for transmittal to the Owner with a copy to the Architect prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Construction Manager, the Construction Manager's consultants, the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 Owner's Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 Property Insurance

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for the Architect's, Contractor's, and Construction Manager's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 **Boiler and Machinery Insurance.** The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Construction Manager, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 **Loss of Use Insurance.** The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, adjoining 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, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 **Waivers of Subrogation.** 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, and (2) the Construction Manager,

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Architect, Architect's consultants, separate contractors described in Article 6, 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 covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as the Owner and Contractor may have to the proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, Owner's separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance 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 requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or distribution of insurance proceeds in accordance with the direction of the arbitrators.

§ 11.4 Performance Bond and Payment Bond

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 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.

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 observation 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 which the Construction Manager or Architect has not specifically requested to observe 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, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or one of the other Contractors in which event the Owner shall be responsible for payment of such costs.

§ 12.2 Correction of Work

§ 12.2.1 Before or After 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, whether discovered before or after 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 an 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 written 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 or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period 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.

§ 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, whether completed or partially completed, of the Owner or separate contractors or other Multiple Prime Contractors 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 except that, 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

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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 such 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 such assignment.

§ 13.3 Written Notice

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity or to an officer of the corporation for which it was intended; or if delivered at or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 Rights and Remedies

§ 13.4.1 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.

§ 13.4.2 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 in writing.

§ 13.5 Tests and Inspections

§ 13.5.1 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 (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 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 13.5.1, 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 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 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.

§ 13.5.4 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.

§ 13.5.5 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.

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§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may 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.

§ 13.7 Time Limits on Claims

The Owner and the Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time 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 the Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

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 or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, 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 promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, 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' written notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor 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' written 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 for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- .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 above reasons exist, the Owner, after consultation with the Construction Manager, and upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, 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' written 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 as described in 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 written 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
- .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 Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

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, 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.

§ 15.1.2 Notice of Claims. Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Construction Manager and Architect, if the Construction Manager and or Architect is not serving as the Initial Decision Maker. Claims by either party must 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 Continuing Contract Performance. 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. The Construction Manager will prepare Change Orders and the Architect will issue a Certificate for Payment or Project Certificate for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 Claims for Additional Cost. If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.3.

§ 15.1.5 Claims for Additional Time

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein 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.

§ 15.1.5.2 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.

§ 15.1.6 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 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, 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 arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no 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

Init.

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 such 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 and the Architect and Construction Manager, if the Architect or Construction Manager 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 an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, 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 15.1.6 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 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. 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.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Either party, at its sole discretion, 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 Either party, at its sole discretion, 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 the Owner and Contractor under this Agreement.

SECTION 007300 SUPPLEMENTARY GENERAL CONDITIONS

SUPPLEMENTARY GENERAL CONDITIONS A232-2009

The following supplements modify the "General Conditions of the Contract for Construction," AIA Document A232-2009. 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. ADMINISTRATION OF THE CONTRACT
5. SUBCONTRACTORS
6. CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
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SECTION 007300 SUPPLEMENTARY GENERAL CONDITIONS

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, all documents which are part of the Bid package, including but not limited to sample forms, the Bid Form, the Contractor's completed Bid and the Award Letter."

1.1.2 THE CONTRACT

Add the following text at the end of subparagraph (5):

"except as set forth in § 3.7.3, §5.3 and § 5.4."

Add the following new Section: 1.10 Terms Used

"The terms "knowledge", "recognize", and "discover", their respective derivatives and similar terms in the Contract Documents, as used in reference to the Contractor, shall be interpreted to mean that which the Contractor knows, recognizes and discovers in exercising the care, skill and diligence required by the Contract Documents. The term "reasonably inferable" and similar terms in the Contract Documents shall be interpreted to mean reasonably inferable by a contractor familiar with the Project and exercising the care, skill, and diligence required of the Contractor by the Contract Documents."

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following Paragraphs:

1.2.4 In the case of an inconsistency, missing or conflicting information between the Drawings and the Specifications, Contract Documents or between the Contract Documents and applicable standards, codes and ordinances, or within any Contract Document not clarified by addendum, the Contractor shall (i) provide the better quality or greater quantity of Work, or (ii) comply with the more stringent requirements. The Contractor shall submit its proposed work to Architect for review and the work shall be provided in accordance with the Architect's interpretation. The terms and conditions of this Section 1.2.4, however, shall not relieve the Contractor of any of the obligations set forth in the Contract Documents, including Sections 3.2 and 3.7.

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

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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. 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. ."

Delete Paragraph 1.5.2 in its entirety.

ARTICLE 2: OWNER

2.1 General

2.1.2 Delete Paragraph 2.1.2 in its entirety.

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.1 Delete the last sentence in this paragraph.

2.2.3 Add the following sentence:

"The Contractor shall at their expense contact all appropriate agencies or utilities to determine the location of all Utilities and, 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, together with being solely responsible for any and all other claims, charges, damages, expenses, fees or liabilities arising out of any acts or omissions in failing to accurately identify said utilities."

2.2.5 Delete Subparagraph 2.2.5 in its entirety and substitute the following:

2.2.5 The Contractor shall be furnished free of charge up to five (5) sets of the Drawings and Project Manuals. Additional sets will be furnished at the cost of reproduction, postage and handling.

2.3 Insert the following words after "repeatedly" in the second line: "or materially".

2.4 Delete the last sentence and substitute the following new sentence:

"If the payments then or thereafter due to the Contractor are not sufficient to cover such amount, at the Owner's option, the excess shall be deducted from any payment thereafter due to the Contractor or shall be paid by the Contractor immediately upon demand of the Owner."

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ARTICLE 3: CONTRACTOR

3.1.4 Insert the word "observations" after the word "test" in the last line of the sentence.

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

Delete the third sentence in Paragraph 3.2.4.

3.2.1 Add the following text at the end of the existing subparagraph:

"Prior to execution of the Agreement, the Contractor and each Subcontractor has evaluated and satisfied themselves as to the conditions and limitations under which the Work is to be performed, including, without limitation: (i) the location, condition, layout and nature of the Project site and surrounding areas, (ii) generally prevailing climatic conditions, (iii) anticipated labor supply and costs, (iv) availability and cost of materials, tools and equipment, and (v) other similar issues. The Owner assumes no responsibility or liability for the physical condition or safety of the Project site or any improvements located on the Project site as it relates to the Work. Except as set forth in Section 10.3, the Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the Contract Sum or the Contract Time in connection with any failure by the Contractor or any Subcontractor to have complied with the requirements of this Section 3.2.1."

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.2 Add the following text at the end of the existing sentence: "and for any damages, losses, costs, and expenses resulting from such acts or omissions."

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 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 any acts or omissions with such use.

3.4 LABOR AND MATERIALS

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

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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 and are expressly waived.

- 3.4.5 Under no circumstances shall the Contractor's Work proceed prior to preparatory 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.
- 3.4.6 The Contractor shall make reasonable efforts to only employ or use labor in connection with the Work capable of working harmoniously with all trades, crafts, and any other individuals associated with the Project. The Contractor shall also use reasonable efforts to minimize the likelihood of any strike, work stoppage, or other labor disturbance.
- 3.4.7 In case the progress of the Work is affected by any undue delay in furnishing or installing any items, materials or equipment required under the Contract Documents because of such conflict involving any such labor agreement or regulation, the Owner may require that other items, materials or equipment of equal kind and quality be provided pursuant to a Change Order or Construction Change Directive.

3.5 WARRANTY

Add the following Paragraphs:

- 3.5.1 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 one year after Acceptance by the Owner, and will maintain all items in condition that conforms with the Contract Documents during the period of warranty.
- 3.5.2 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.
- 3.5.3 In addition to the General Warranty there are other warranties required for certain items for different periods of time than the one year 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.
- 3.5.4 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.
- 3.5.5 The Contractor agrees to assign to the Owner at the time of final completion of the Work any and all manufacturers' warranties relating to materials and labor used in the Work and further agrees to perform the Work in such manner so as to preserve any and all such manufacturers' warranties.

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3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

3.7.1 Delete the second sentence and substitute the following new sentence:

"The Contractor shall secure, pay for, and, as soon as practicable, furnish the Owner, Construction Manager and Architect with copies and/or certificates of all 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.

3.7.3 Deleted in its entirety and replace with the following: "If the Contractor, any of its Subcontractors or any Sub-subcontractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor, any of its Subcontractors or any Sub-subcontractor shall assume appropriate responsibility for such Work and shall bear the costs, damages, losses, expenses of every kind, including reasonable attorneys' fees, attributable to correction."

Add the following Paragraph:

3.7.6 No separate inspection performed or failed to be performed by the Owner, Construction Manager or Architect hereunder shall be a waiver of any of the Contractor's obligations hereunder or be construed as an approval or acceptance of the Work or any part thereof.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULE

Add the following Paragraphs:

3.10.5 The schedule shall indicate the proposed starting and completion dates for the various subdivisions of the Work as well as the totality of the Work. The schedule shall be updated every thirty (30) days and submitted to Architect with Contractor's Applications for Payment. Each schedule shall contain a comparison of actual progress with the estimated progress for such point in time stated in the original schedule. If any schedule submitted sets forth a date for Substantial Completion for the Work or any phase of the Work beyond the Date(s) of Substantial Completion established in the Contract (as the same may be extended as provided in the Contract Document(s), the Contractor shall submit to Owner and Architect for their information and to the Construction Manager for its review and approval, a narrative description of the means and methods which Contractor intends to employ to expedite the progress of the Work to ensure timely completion of the various phases of the Work as well as the totality of the Work. To ensure such timely completion, Contractor shall take all necessary action including, without limitation, (i) working additional shifts or overtime, (ii) supplying additional manpower, equipment and facilities, and (iii) other similar measures (hereinafter referred to collectively as "Corrective Measures"). In that event, Contractor is required to implement Corrective Measures, then Contractor shall not be entitled to an adjustment in the Contract Sum, the Schedule or the Contract Time. The date of final completion shall not be changed without the written consent of the Owner.

3.10.6 The construction schedule shall be in a detailed precedence-style critical path management ("CPM") or primavera-type format satisfactory to the Construction Manager and Architect that shall also (i) provide a graphic representation of all

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activities and events that will occur during performance of the Work; (ii) identify each phase of construction and occupancy; and (iii) set forth dates that are critical in ensuring the timely and orderly completion of the Work in accordance with the requirements of the Contract Documents (hereinafter referred to as "Milestone Dates").

- 3.10.7 In the event the Construction Manager and/or Architect determine that the performance of the Work, as of a Milestone Date, has not progressed or reached the level of completion required by the Contract Documents, the Construction Manager shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation, implementing Corrective Measures. Such Corrective Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Construction Manager's right to require Corrective Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule.
- 3.10.8 The Contractor shall not be entitled to an adjustment in the Contract Sum or Contract Time in connection with Extraordinary Measures required by the Construction Manager under or pursuant to this Section 3.10.
- 3.10.9 The Construction Manager may exercise the rights furnished the Construction Manager under or pursuant to this Section 3.10 as frequently as the Construction Manager deems necessary to ensure that the Contractor's performance of the Work will comply with any Milestone Date or completion date(s) set forth in the Contract Documents.

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.

3.17 In the second sentence of the paragraph, insert "indemnify and" between "shall" and "hold".

ARTICLE 4: ARCHITECT AND CONSTRUCTION MANAGER

- 4.1 General
4.1.2 Insert "As required by law," at the beginning of the first sentence.
- 4.2 Administration of the Contract

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Delete the first sentence of Paragraph 4.2.10 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 4.2.10 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 4.2.16:

There will be no full-time project representative provided by the Owner or Architect on this project.

Add to Paragraph 4.2.19 "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.

Add the following new Paragraph:

5.2.5 Upon written request, the Contractor shall provide to the Owner and Construction Manager an executed copy of all subcontracts, purchase orders and other agreements relating to the Work.

5.3 SUBCONTRACTOR RELATIONS

Add the following new Paragraphs:

5.3.1 All subcontracts shall be in writing and shall specifically provide that the Owner is an intended third-party beneficiary of such subcontract. Each subcontract shall contain a contingent assignment of the subcontract to the Owner consistent with Section 5.4

5.3.2 The Contractor shall be responsible for any and all Subcontractors working under it and shall carry insurance for all Subcontractors or ensure that they are carrying it themselves so as to relieve the Owner of any and all liability to be covered by insurance.

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ARTICLE 6: CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

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)

7.1.3 Insert the following sentence at the end of the existing sentence: "Except as permitted in Section 7.3, a change in the Contract Sum or the Contract Time shall be accomplished only by Change Order."

Add the following new Paragraphs:

7.1.4 A field directive or field order shall not be recognized as having any impact upon the Contract Sum or the Contract Time and the Contractor shall have no claim therefor unless it shall, prior to complying with same and in no event later than ten (10) working days from the date such direction or order was given, submit to the Owner, Construction Manager and Architect for the Architect's and Construction Manager's evaluation and Owner's approval of its change proposal.

7.1.5 When submitting any proposal for Changes in the Work, the Contractor shall include and set forth in clear and precise detail breakdowns of labor and materials for all trades involved for the estimated impact on the construction schedule. If request, the Contractor shall furnish spreadsheets of any Subcontractors.

7.2 CHANGE ORDERS

Add the following new Paragraph 7.2.1 – Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including, but not limited to, all direct and indirect costs associated with such change and any and all adjustments to the Contract Sum and the construction schedule, including the Contract Time.

ARTICLE 8: TIME

8.2 PROGRESS AND COMPLETION

Add the following Paragraphs:

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8.2.1.1 Refer to Specification Section SUMMARY OF WORK 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 "arbitration" 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

9.2 SCHEDULE OF VALUES

Add the following Paragraphs:

9.2.1 The Schedule of Values shall be submitted 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 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:

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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.
- .11 reasonable evidence that the Work has not progressed as indicated on the Application for Payment; or
- .12 otherwise is responsible for a substantial and material breach of a provision of the Contract Documents.

Add the following Paragraph:

9.5.4 If the Contractor disputes any determination by the Construction Manager or the Architect made in accordance with the foregoing with regard to any Certificate of Payment, the Contractor nevertheless shall expeditiously continue to prosecute the Work.

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 30 days after Owner's receipt of the Certificate for Payment.

Add the following Paragraph:

9.6.2.1 Notwithstanding anything in Section 9.6.2 to the contrary, in the event the Construction Manager has reasonable cause to believe a Subcontractor is not being paid by the Contractor, the Construction Manager may elect to make any payment requested by the Contractor on behalf of a Subcontractor of any tier jointly payable to the Contractor and such Subcontractor, provided that in the event the Contractor disputes the sum due to the Subcontractor, Construction Manager shall only pay the sum not disputed by the Contractor, provided that the Contractor provides satisfactory assurance such as a bond to Owner with respect to payment of the disputed sum. The Contractor and such Subcontractor shall be responsible for the allocation and disbursement of funds included as part of any such joint payment. In no event shall any joint payment be construed to create any (i) contract between the Owner and a Subcontractor of any tier, (ii) obligations from the Owner to such Subcontractor, or (iii) rights in such Subcontractor against the Owner.

9.7 FAILURE OF PAYMENT

SECTION 007300 SUPPLEMENTARY GENERAL CONDITIONS

In first sentence, strike the first reference to "seven" and insert "thirty (30)". Also strike "binding dispute resolution" and insert "remedies at law or in equity" and add the following at the end of the Paragraph: "Notwithstanding the preceding sentence, the Contractor shall not stop the Work during the pendency of a bona fide dispute between the Owner and the Contractor, provided any sums in dispute claimed by the Contractor are placed in escrow and Owner agrees to pay said disputed sum in accordance with the resolution of the dispute.

Add the following Paragraph:

9.7.1 If the Owner is entitled to reimbursement or payment from the Contractor under or pursuant to the Contract Documents, such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained in the Contract Documents to the contrary, if the Contractor fails to promptly make any payment due the Owner, or if the Owner incurs any costs and expenses to cure any default of the Contractor or to correct defective Work, the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion, elect either to (i) deduct an amount equal to that which the Owner is entitled from any payment then or thereafter due the Contractor from the Owner, or (ii) issue a written notice to the Contractor reducing the Contract Sum by an amount equal to that which the Owner is entitled.

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, Construction Manager 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, Construction Manager 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 work place, 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, along with the shipping slips that include those products.

STATE OF DELAWARE

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SECTION 007300 SUPPLEMENTARY GENERAL CONDITIONS

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 LIABILITY INSURANCE

11.1.4 Strike "the Owner" immediately following "(1)" and strike "and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations."

Add the following Paragraph:

11.1.5 If the Contractor fails to purchase or maintain or require to be purchased or maintained the liability insurance specified in the Contract Documents, the Owner may (but shall not be obligated to) purchase such insurance on the Contractor's behalf and shall be entitled to be repaid for any premiums paid therefor by Contractor in the manner set forth in Section 2.4 and/or as provided in Section 9.7.2, at Owner's election.

11.2 OWNER'S LIABILITY INSURANCE

Delete Paragraph 11.2 in its entirety.

11.3 PROPERTY INSURANCE

Delete Paragraph 11.3 and its subparagraphs in their entirety and replace with the following:

11.3 The Owner will not provide Builder's All Risk Insurance for the Project. The Contractor and all Subcontractors shall provide property coverage for their tools and equipment, as necessary. Any mandatory deductible required by the Contractor's Insurance shall be the responsibility of the Contractor.

11.4 PERFORMANCE BOND AND PAYMENT BOND

11.4.1 Add the following sentence: "The bonds will conform to those forms approved by the Office of Management and Budget."

Add the following new Paragraph:

11.4.3 If any Surety hereunder makes any assignment for the benefit of creditors, or commits any act of bankruptcy, or is declared bankrupt, or files a voluntary petition in bankruptcy, or in the reasonable opinion of the Owner is insolvent, the Contractor shall immediately furnish and maintain another Surety in accordance with the provisions of this Section 11.4 satisfactory to the Owner.

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

12.2.2 AFTER SUBSTANTIAL COMPLETION

12.2.2 Add the following sentence at the end of the existing paragraph:

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SECTION 007300 SUPPLEMENTARY GENERAL CONDITIONS

If prior to the date of Substantial Completion, the Contractor, a subcontractor or anyone for whom either is responsible uses or damages any portion of the Work, including, without limitation, mechanical, electrical, plumbing and other building systems, machinery, equipment or other mechanical device, the Contractor shall cause such item to be restored to "like new" condition at no expense to the Owner.

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 determined by the Architect in consultation with the Construction Manager and 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

Strike "except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4."

Insert "except that, if the parties have selected arbitration as the method of dispute resolution, the Delaware Arbitration Act, 10 Del. C. §5701, shall govern Section 15.4."

13.6 INTEREST

Strike "the date payment is due at such rate as the parties may 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." Insert "30 days of presentment of the authorized Certificate of Payment at the annual rate of 12% or 1% per month.

13.7 TIME LIMITS ON CLAIMS

Strike the last sentence.

Add the following Paragraph:

13.8 CONFLICTS WITH FEDERAL STATUTES OR REGULATIONS

13.8.1 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, Construction Manager and Owner immediately upon discovery.

Add the following Paragraph:

SECTION 007300 SUPPLEMENTARY GENERAL CONDITIONS

13.9 "GENERAL PROVISIONS – All personal pronouns used in this Contract, whether used in the masculine, feminine, or neuter gender, shall include all other genders; and the singular shall include the plural and vice versa. Titles of articles, Sections and Sections are for convenience only and neither limit nor amplify the provisions of this Contract in itself. The use herein of the word "including", when following any general statement, term, or matter, shall not be construed to limit such statement, term, or matter to the specific items or matters set forth immediately following such word or to similar items or matters, whether or not non-limiting language (such words as "without limitation", or "but not limited to", or words of similar import) is used with reference thereto, but rather shall be deemed to refer to all other items or matters that could reasonably fall within the broadest possible scope of such general statement, term or matter.

Wherever possible, each provision of this Agreement shall be interpreted in a manner as to be effective and valid under applicable law. If, however, any provision of this Agreement, or portion thereof, is prohibited by law or found invalid under any law, only such provision or portion thereof shall be ineffective, without in any manner invalidating or affecting the remaining provisions of this Agreement or valid portions of such provision, which are hereby deemed severable.

Each party hereto agrees to do all acts and things and to make, execute and deliver such written instruments, as shall from time to time be reasonably required to carry out the terms and provisions of the Contract Documents.

Any specific requirement in this Contract that the responsibilities or obligations of the Contractor also apply to a Subcontractor is added for emphasis and is also hereby deemed to include a Subcontractor of any tier. The omission of a reference to a Subcontractor in connection with any of the Contractor's responsibilities or obligations shall not be construed to diminish, abrogate, or limit any responsibilities or obligations of a subcontractor of any tier under the Contract Documents or the applicable subcontract.

Contractor makes the following representations:

1. Contractor has familiarized itself with the nature and extent of the Contract Documents, Work, locality, local conditions, and with Federal, State and Local Laws, ordinances, rules and regulations that may in any manner effect costs, progress or performance of the Work.
2. Contractor has made examinations, investigations, tests and studies at the project site, as he deems necessary for the performance of the Work at the Contract Price and within the Contract Time. Contractor has correlated the results of all such observations, examinations, tests, reports and data with the terms and conditions of the other Contract Documents.
3. Contractor has given the Architect written notice of all conflicts, errors or discrepancies that he has discovered in the Contract Documents and the written resolution thereof by the Architect is acceptable to the Contractor."

ARTICLE 14: TERMINATION OR SUSPENSION OF THE CONTRACT

Add the following additional Paragraphs to 14.1.1:

- .5 disregards the instruction of the Construction Manager or Architect when such instructions are based on the requirements of the Contract Documents.

SECTION 007300 SUPPLEMENTARY GENERAL CONDITIONS

- .6 fails to furnish the Owner and Construction Manager with assurances satisfactory to the Owner and Construction Manager evidencing the Contractor's ability to complete the Work in compliance with the requirements of the Contract Documents.
- .7 fails or neglects to progress work in such a manner to reasonably assure completion of the Work within the Contract Time or in accordance with the Construction Schedule.
- .8 purposefully engages in a strike or work stoppage, or is in any way responsible for hindering or delaying the work of other trades, or ceases to work due to picketing or labor disputes of any kind.

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

15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

Delete Paragraph 15.1.6 and its subparagraphs in their entirety.

15.2 INITIAL DECISION

Delete Paragraph 15.2.5 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".

15.4 ARBITRATION

Delete Paragraph 15.4 and its subparagraphs in their entirety.

END OF SUPPLEMENTARY GENERAL CONDITIONS

SECTION 007343 – WAGE RATE REQUIREMENTS

1. SUMMARY

- 1.1. In accordance with Delaware Code, Title 29, Chapter 69, Section 6912, 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.
- 1.2 This approved scale of wages must be posted by the Contractor in a prominent and easily accessible place at the site of the work.
- 1.3 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.
- 1.4 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.
- 1.5 "In accordance with Delaware Code, Title 29, Section 6912, as amended July 5, 1994, contractors shall furnish sworn payroll information to the Department of Labor on a weekly basis for each contract which exceeds \$15,000 for renovation work and \$100,000 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."
 - 1.5.1 A Payroll Report, available from the Department of Labor is to be used to provide this information.
- 1.6 A copy of the Prevailing Wages for the project is attached hereto.

END OF SECTION

STATE OF DELAWARE
 DEPARTMENT OF LABOR
 DIVISION OF INDUSTRIAL AFFAIRS
 OFFICE OF LABOR LAW ENFORCEMENT
 PHONE: (302) 451-3423

Mailing Address:
 225 CORPORATE BOULEVARD
 SUITE 104
 NEWARK, DE 19702

Located at:
 225 CORPORATE BOULEVARD
 SUITE 104
 NEWARK, DE 19702

PREVAILING WAGES FOR BUILDING CONSTRUCTION EFFECTIVE MARCH 15, 2013

CLASSIFICATION	NEW CASTLE	KENT	SUSSEX
ASBESTOS WORKERS	21.87	26.94	39.20
BOILERMAKERS	65.47	33.22	48.83
BRICKLAYERS	46.83	46.83	46.83
CARPENTERS	50.06	50.06	39.82
CEMENT FINISHERS	27.61	29.11	21.20
ELECTRICAL LINE WORKERS	43.49	37.29	28.44
ELECTRICIANS	60.60	60.60	60.60
ELEVATOR CONSTRUCTORS	75.33	40.93	30.55
GLAZIERS	64.10	64.10	54.20
INSULATORS	51.48	51.48	51.48
IRON WORKERS	59.12	59.12	59.12
LABORERS	38.30	38.30	38.30
MILLWRIGHTS	62.18	62.18	48.75
PAINTERS	42.02	42.02	42.02
PILEDRIVERS	67.87	37.64	30.45
PLASTERERS	28.55	28.55	17.50
PLUMBERS/PIPEFITTERS/STEAMFITTERS	59.00	49.26	46.28
POWER EQUIPMENT OPERATORS	57.06	57.06	24.13
ROOFERS-COMPOSITION	21.77	17.96	19.34
ROOFERS-SHINGLE/SLATE/TILE	17.59	17.50	16.45
SHEET METAL WORKERS	62.74	62.74	62.74
SOFT FLOOR LAYERS	45.97	45.97	45.97
SPRINKLER FITTERS	51.75	51.75	51.75
TERRAZZO/MARBLE/TILE FNRS	51.41	51.41	45.45
TERRAZZO/MARBLE/TILE STRS	59.03	59.03	52.63
TRUCK DRIVERS	26.88	23.89	20.03

CERTIFIED: 3/19/13

BY: *Frank [Signature]*
 ADMINISTRATOR, OFFICE OF LABOR LAW ENFORCEMENT

NOTE: THESE RATES ARE PROMULGATED AND ENFORCED PURSUANT TO THE PREVAILING WAGE REGULATIONS ADOPTED BY THE DEPARTMENT OF LABOR ON APRIL 3, 1992.

CLASSIFICATIONS OF WORKERS ARE DETERMINED BY THE DEPARTMENT OF LABOR. FOR ASSISTANCE IN CLASSIFYING WORKERS, OR FOR A COPY OF THE REGULATIONS OR CLASSIFICATIONS, PHONE (302) 451-3423.

NON-REGISTERED APPRENTICES MUST BE PAID THE MECHANIC'S RATE.

PROJECT: Wilmington Campus Renovations, New Castle County

SECTION 011100 - SUMMARY OF WORK

1. RELATED DOCUMENTS

- 1.1 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

- 2.1 The work will be performed under separate prime contracts managed by the Construction Manager.

3. ALTERATIONS & COORDINATION

- 3.1 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

- 4.1 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.
- 4.2 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.
- 4.3 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.
- 4.4 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.
- 4.5 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

- 5.1 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.
- 5.2 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.
- 5.3 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.
- 5.4 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.
- 5.5 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.
- 5.6 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.
- 5.7 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.
- 5.8 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.

5.9 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.

5.10 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

6.1 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.

6.2 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.

6.3 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.

6.4 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 clean up of their work.

6.5 Contractors are reminded that there are limited storage areas available on site. Off site storage will be the responsibility of each individual Contractor.

6.6 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.

6.7 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.

- 6.8 All bids must include insurance limits in accordance with Article 11 of the Section 007300 SUPPLEMENTARY CONDITIONS.
- 6.9 Hoisting, scaffolding and material handling is the responsibility of each Contractor, unless otherwise noted.
- 6.10 Contractor will be responsible for layout of its own work. The Construction Manager will provide benchmark and layout of the building line.
- 6.11 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.
- 6.12 Contractor Scopes of Work and Schedule are interrelated. Familiarity with each is required.
- 6.13 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.
- 6.14 Safety is the responsibility of each individual Contractor. The project will be governed under the guidelines of OSHA.
- 6.15 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.
- 6.16 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.
- 6.17 Contractor shall submit a schedule of values to the Construction Manager prior to the submission of their first invoice for approval on AIA G702/CMa, Application for Payment and G703, Continuation Sheet.

- 6.18 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.
- 6.19 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.
- 6.20 Contractor's License: Submit a copy of all business licenses required by local and state agencies.
- 6.21 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.
- 6.22 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.
- 6.23 Daily clean up 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.
- 6.24 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.
- 6.25 This project is to be constructed adjacent to and in existing buildings. Contractor shall exercise all due precautions to minimize noise, air pollution and any other construction hazards which in any way would cause discomfort or danger to the occupants of the existing building in the area.
- 6.26 Existing mechanical, electrical, plumbing, sprinkler, medical gas, fire alarm, etc. systems will be shut off and locked out by the Owner as required by the Work. Tie-in's and modifications to those systems will be performed by the specific Contractor associated with the work as indicated in the Contract Documents. Re-energizing and re-start up of all systems should be performed by the Owner.
- 6.27 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.

- 6.28 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.
- 6.29 Contractor is responsible for having a competent project superintendent/foreman on-site during all work performed under its contract.
- 6.30 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.
- 6.31 **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.
- 6.32 Contractor shall provide the necessary safety barricades and railings required to complete their work and comply with all OSHA, local code and contract specifications.
- 6.33 **Liquidated Damages:** Contractors are responsible to provide sufficient manpower and equipment and materials to complete work as shown in the project schedule. Any delays in completing a phase of work due to issues caused by a contractor will be subject to a penalty of \$2,000 per calendar day that the work is not completed following the scheduled completion date of that phase of work.
- 6.34 **Temporary Protection:** Provide temporary protection to ensure that no damages occur to existing or new finishes, building components, materials, equipment, etc. In addition, provide all approved signage and safety devices applicable to the referenced temporary protection. An approved temporary protection plan will be required before the initial start of the work.
- 6.35 Provide fine clean up on a daily basis. Fine cleaning will be defined as those means/methods utilized to ensure that all odors, dust, and debris will be non-existent within the project area at the end of each workday. In addition, means and methods shall be utilized that prevent the

migration of odors, dust, debris, and excessive noise from migrating into non-working areas.
An approved cleanup plan will be required before the initial start of the work.

CONTRACT NO. B-05 - DEMOLITION

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

- 5-1. This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following: Provide all labor, material, trucking, equipment, hoisting, scaffolding, power, temporary facilities, permit fees, supervision, layout, clean up, etc. for the complete performance of all selective demolition work.
- 5-2. Items of demolition shall include, but not necessarily be limited to, complete structures, concrete slabs, foundations, wall framing, masonry walls, structural steel, interior partitions, ceilings, auditorium seating, flooring, ceramic tile, stage rigging equipment, mechanical and electrical equipment and fixtures, and related equipment.
- 5-3. Contractor will be required to furnish necessary dumpsters for materials to be demolished including the removal from site and proper disposal.
- 5-4. Contractor will be required to provide adequate control of dust and debris during demolition.
- 5-5. Remove from site all combustible materials. No on site burning of material will be allowed at any time. Contractor shall keep required fire extinguishing equipment in serviceable condition, properly distributed so that it will be available for immediate use, particularly during any acetylene cutting operations. This Contractor shall afford adequate facilities for inspection by, and carry out the recommendations of, the local Fire Department. This Contractor shall maintain one fire riser during demolition.
- 5-6. This contractor shall remove the mechanical, plumbing & electrical system. This contractor shall coordinate the removal of mechanical, plumbing & electrical systems with the Mechanical & Plumbing and Electrical contractor prior to demolition. The Mechanical & Plumbing and Electrical contractors shall identify and safe off all systems scheduled to be removed. The Demolition Contractor shall notify all such authorities in advance and obtain their approval and cooperation in shutting off utilities.
- 5-7. Remove Hall of Fame Wall down to existing masonry.
- 5-8. Remove diamond plate and turn over to the Construction Manager for installation by others.
- 5-9. Remove all ceiling support rods and clips associated with this contractors work.

- 5-10. Roof removal shall be by the Roofing Contractor.
- 5-11. This contractor shall cover all exposed openings after demolition. Openings exposed to the outside elements shall be properly covered and made weather tight.
- 5-12. The Electrical Contractor shall trench the concrete slab as required for their floor boxes as noted on Dwg. A-101, keynote 36.
- 5-13. The Plumbing Contractor shall saw cut and remove the concrete slab as noted on Dwg. A-101, keynote 37.
- 5-14. Saw cutting of masonry walls as noted on Dwg. A-101 shall be by the Masonry Contractor.
- 5-15. Removal of the concrete ramp per Dwg. A-101, keynote 26 shall be by the Concrete Contractor.
- 5-16. This Contractor shall notify the Construction Manager immediately if hazardous materials (i.e. asbestos, lead, PCB's, etc.) are uncovered. At that time, all work in the affected area will be stopped until proper removal can be completed by others (i.e. hazardous material abatement contractor).
- 5-17. Temporary maintenance standby labor such as for temporary water, temporary power, temporary light and the like where required due to this Contractor's work is to be included within the Contract Price.
- 5-18. This Project is to be constructed inside an occupied building. The Contractor shall exercise all due precautions to minimize noise, air pollution and any other construction hazards which in any way would cause discomfort or danger to the occupants of the existing buildings in the area.
- 5-19. This Contractor shall clean public streets and sidewalks daily. This Contractor shall collect and remove from the site daily all rubbish, scrap and other debris resulting from its operations.
- 5-20. This Contractor shall include in the Contract Price the cost of all police traffic details required for the execution of the Work.
- 5-21. All light, power, water and any other utilities, including special provisions for hookups to same for this Contractor's operations will be provided by this Contractor within the Contract Price and unit prices.
- 5-22. This Contractor shall comply with all Federal, State and local laws requiring noise control and hours which work is to be conducted. Mufflers, "whisperized" compressors, etc., shall be

used as required for compliance with laws and ordinances throughout the course of the Work.

- 5-23. It is understood that all Work under this Contract shall be in strict accordance with the Building Code with the City, State and any other agency having jurisdiction. In the event of any conflict in any provisions of any regulatory agency and Contract Documents, the more stringent requirements shall apply.
- 5-24. This Contractor is aware of the structural capacities of various portions of the structure. Cranes, materials, deliveries and material storage, shall not exceed rated capacities without this Contractor taking appropriate steps to compensate for the imposition of loads which may exceed the design criteria and which are imposed solely by this Contractor's operations.
- 5-25. This Contractor shall provide any and all "fire watch" personnel required due to the Contractor's cutting, burning, welding or other open flame activity.
- 5-26. This Contractor shall submit proposed methods and operations of building demolition to the Owner, his representative or agents for review prior to the start of work, including a schedule of coordinating the shut off, capping and/or continuation of utility services as required.
- 5-27. This Contractor shall visit the site of the proposed work, fully acquaint and familiarize himself 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 he may see fit so that he 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 himself with all conditions which might affect the work shall not be allowed.
- 5-28. This Contractor, before commencement of any part of the Work, shall give any notices, required to be given to an adjoining landowner and other parties.
- 5-29. This Contractor shall maintain all required means of egress from the existing buildings and alter such stairs, platforms and fire escapes as required to satisfy all agencies having jurisdiction.
- 5-30. This Contractor shall take special precautions to shore, brace and support all their work during demolition.
- 5-31. Any existing piping, subsoil drainage systems, conduit, manholes, tanks, etc., which are abandoned shall be plugged with concrete and to the extent within or beneath the limits of excavation, removed. All others are to be maintained and repaired or otherwise restored to proper operating condition.
- 5-32. Existing services to remain will be defined by the Owner prior to or immediately after the start of demolition work.

- 5-33. Any damage to public property, private property, or to utilities due to demolition operations, or the Contractor's neglect, shall be corrected by this Contractor, in a manner approved by the Owner and the parties whose property has been damaged, all at no additional cost to the Owner.
- 5-34. Miscellaneous equipment and furnishings belonging to the Owner, if to be retained by the Owner, will be removed before the commencement of the demolition work. All other equipment or furnishings attached, remaining, in the building at the start of the demolition work shall be protected by this Contractor.
- 5-35. All equipment, materials and debris shall be regularly removed by this Contractor from the Site as work progresses in such manner as not to create a nuisance, and shall be disposed of by this Contractor at his own expense, at locations to be determined by this Contractor. Permits required in connection with the disposal of the materials shall be obtained by this Contractor. Disposal shall be in accordance with all Federal, State and local laws, rules, codes, orders and regulations.
- 5-36. Materials and equipment to be salvaged or which have been sold to others by this Contractor must be promptly removed by this Contractor, and shall not be stored at the site. The offering, advertising, display or sale of materials and equipment will not be permitted.
- 5-37. This Contractor shall, prior to the start of Work, provide the name and location of proposed dump site to receive the demolition debris. Dump site must be licensed and acceptable to all local government agencies having jurisdiction.
- 5-38. This Contractor shall provide signed and stamped dump site debris tickets identifying the location, date, time and quantity of debris deposited at the dump site.
- 5-39. Provide in the base bid \$10,000 allowance for work as directed by the Construction Manager. All unused portions of the allowance will be returned at the end of the project.

CONTRACT NO. B-06 - 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
Section 03 30 00	Cast-In-Place Concrete
Section 03 30 50	Integral Concrete Waterproofing
Section 03 35 11	Concrete Floor Finishes
Section 07 26 16	Under-Slab Vapor Barrier/Retarder
Section 07 90 05	Joint Sealers

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

- 6-1. Provide concrete foundations, footings, piers, wall footings, grade beams, slabs on grade, slabs on deck and all reinforcing steel.
- 6-2. This Contractor will be responsible for laying out all concrete work as shown on the structural and architectural drawings.
- 6-3. This Contractor to furnish and install reinforcing steel, admixtures, curing compound, sealers as required in the Contract Documents.
- 6-4. Provide underpinning of foundations.
- 6-5. Provide integral concrete waterproofing for slabs-on-grade.
- 6-6. Underslab vapor barrier/retarder, reglets, waterstops, control and construction joints
- 6-7. Provide caulking at control and construction joints.
- 6-8. Placement of related items furnished under other specification sections.
- 6-9. 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 as-built drawings to steel erector for coordination prior to steel placement.
- 6-10. All blockouts and embedments required by plans and specifications.

- 6-11. This Contractor to furnish and install all sleeves for incoming utilities at the perimeter walls.
- 6-12. This Contractor is responsible for grouting all structural steel base or leveling plates.
- 6-13. Include all weather, frost protection, and water pumping as required. This Contractor is also responsible for the premiums required for hot water, heated aggregate and admixtures for cold weather concrete.
- 6-14. Coordinate the "Notch" in the concrete slabs to allow for a future Contractor to easily install expansion joint details.
- 6-15. Provide concrete fill at steel pan stair treads, landings and associated items.
- 6-16. The Demolition Contractor will be responsible for removing the existing concrete slabs. Once the demolition is done the area will then be turned over to the Concrete Contractor who will be excavating and installing the foundations. The Concrete Contractor is responsible for additional excavation and backfilling within the building as may be required to accommodate the sloped floors in the auditorium, varying slab thicknesses, depressed slabs and grade changes
- 6-17. Furnish, install and maintain stone underslab.
- 6-18. Backfilling and compaction around all walls will be the responsibility of the Concrete Contractor.. Close coordination with the Masonry, Mechanical and Electrical Contractors is required.
- 6-19. Provide and maintain perimeter fall protection at excavated area per OSHA standards.
- 6-20. Provide certified anchor bolt verification drawings to the Construction Manager for review prior to steel erection.
- 6-21. Equipment bases and foundations shall be the responsibility of the Contractor providing the equipment.
- 6-22. All concrete testing will be completed by the Construction Manager, however, it will be the responsibility of this Contractor to furnish all samples.
- 6-23. Provide offsite disposal of all excess or unsuitable excavated materials.
- 6-24. Provide specified sloping for floor drains as detailed (Drains to be furnished by Mechanical Contractor.)
- 6-25. This Contractor shall include the finishing of concrete slabs around all floor penetrations throughout the slab areas. These penetrations will consist of electrical boxes, stubbed

conduits, mechanical piping and electrical and technology conduit stubs, etc.

- 6-26. This Contractor shall provide written documentation that all concrete slabs are within the tolerance required by the contract documents. Testing and analysis to be paid for by this Contractor.
- 6-27. This Contractor shall provide written documentation that all concrete slabs are within the tolerance required by the contract documents. Testing and analysis to be paid for by this Contractor.
- 6-28. Provide plywood covers on at all diamonds on the 1st floor. These covers shall be installed immediately following the placement of concrete slab on grade.
- 6-29. Remove and replace the existing concrete ramp per key note 26 on drawing A101.
- 6-30. Provide in the base bid \$5,000 allowance for work as directed by the Construction Manager

CONTRACT NO. B-07 - 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 06 10 00	Rough Carpentry
Section 06 20 00	Finish Carpentry
Section 06 20 13	Framed Decorative Panel Systems
Section 07 90 05	Joint Sealers
Section 08 11 13	Hollow Metal Doors and Frames
Section 08 14 16	Flush Wood Doors
Section 08 33 00	Side Coiling Fire and Smoke Rated Doors
Section 08 33 23	Overhead Coiling Doors
Section 08 43 13	Aluminum Framed Storefronts
Section 08 71 01	Door Hardware
Section 10 51 13	Lockers
Section 08 80 00	Glazing
Section 08 83 00	Mirrors
Section 09 64 10	Wood Strip Flooring
Section 09 64 29	Stage Flooring
Section 10 11 01	Visual Display Boards
Section 10 82 00	Toilet Accessories
Section 10 51 13	Lockers
Section 12 34 00	Laminate Clad Casework
Section 12 36 00	Countertops and Backsplashes
Section 14 42 00	Vertical Platform Lift

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

- 7-1. Provide labor and materials to perform the work related to all carpentry and general work.
- 7-2. All rough carpentry related to the interior of the building including blocking, wood nailers, etc. for the installation of fire extinguishers, doors, windows, toilet accessories, cabinets, toilet partitions, casework, millwork, etc. including fire treating, as required.
- 7-3. Provide Framed Decorative Panel Systems
- 7-4. Provide hollow metal and wood doors and frames, including receipt of doors and frames at the curb side.

- 7-5. Provide finish hardware related to all doors (hollow metal, wood and aluminum), including receipt of hardware at the curb side. Coordinate electrical requirements with any electric door hardware. The Electrical Contractor will provide power to automatic hardware. Low voltage wiring from the controller to hardware shall be furnished and installed by the Carpentry and General Works Contractor.
- 7-6. All field trimming required to adjust to existing conditions.
- 7-7. Provide all millwork and trim.
- 7-8. Provide laminate clad casework, countertops and backsplashes. Provide locks for all doors & drawers of casework, UON, Key alike by room. Coordinate cutting holes in casework with other trades.
- 7-9. Provide side coiling fire and smoke rated doors.
- 7-10. Provide overhead coiling doors.
- 7-11. Provide aluminum framed storefronts
- 7-12. Provide glazing
- 7-13. Provide mirrors
- 7-14. Provide wood strip flooring
- 7-15. Provide stage flooring
- 7-16. Provide visual display boards.
- 7-17. Provide toilet accessories.
- 7-18. Provide lockers
- 7-19. Provide ADA bench
- 7-20. Provide lobby casework including all blocking and stained trim
- 7-21. Provide all wood blocking at the roof per Bid Pack A dwg. A-431 dated 4/15/13.
- 7-22. Anchoring devices, fasteners, inserts and other related items associated with the installation of the above items.

- 7-23. This Contractor shall include in the base bid 120 hours of Journeyman carpenter time and 120 hours of common labor time for work to be directed by the Construction Manager.
- 7-24. This Subcontractor shall at a minimum provide and maintain for the length of the project, one temporary fire extinguisher for each 3,000 sq. ft of the protected building area. Fire extinguishers shall be 10lb, Multi-Purpose (ABC) dry chemical, UL labeled, with a rating of 3a:40bc.
- 7-25. Provide scaffolding in the Theater for use by all contractors. The scaffolding will be equipped with access stairs and safety rail around the entire perimeter. The scaffolding will be setup in 2 stages. The first stage is full height to allow for the installation of mechanical, plumbing, electrical, and fire protection. The scaffolding will be within 6 feet of the bottom of the roof joists. The second stage is to lower the scaffolding to allow for the installation of the acoustical ceilings, lights, and audio visual. The scaffolding will be just below the bottom of the lowest acoustical ceiling cloud. Access to the sidewalls of the auditorium, while the scaffold is installed, will be required.
- 7-26. Provide scaffolding in the existing pool for use by all contractors. The scaffolding will be equipped with access stairs and safety rail around the entire perimeter. The scaffolding will be setup in to allow the removal of the acoustical ceiling, installation of the new fire sprinkler system, and re-installation of the acoustical ceiling. The scaffolding will be installed to within 6 feet of the existing acoustical ceiling. The pool will not be drained or covered therefor this contractor shall be responsible for any damages during erection and dismantlement.
- 7-27. Provide and maintain temporary wood railings and handrails at the stairs to the stage and along the edge of the stage. Remove and dispose of the railings and handrails when directed by the Construction Manager.
- 7-28. Provide and maintain temporary wood frames with reinforced poly for weather protection, in all of the window and door openings on the exterior elevations, until the windows and doors are ready. Remove and dispose of the temporary frames immediately prior to window and door installation. Provide temporary wood doors at the exterior doors, to include self-closing hardware and padlocks.
- 7-29. Provide in the base bid \$10,000 allowance for work as directed by the Construction Manager

CONTRACT NO. B-08 - 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
Section 04 20 00	Unit Masonry
Section 07 13 00	Sheet Waterproofing
Section 07 62 00	Sheet Metal Flashing and Trim
Section 07 90 05	Joint Sealers

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

- 8-1. Provide concrete masonry units, decorative concrete masonry units, ceramic glazed structural clay facing tile, brick, reinforcing, accessories and related work.
- 8-2. Provide caulking of masonry to masonry and to dissimilar materials.
- 8-3. Provide integral masonry flashings, expansion joints, insulation and other related items as required.
- 8-4. Mock up as required. This Contractor will be responsible for demolition, removal and disposal of the mock-up when it is no longer required.
- 8-5. Grouting of door frames at masonry openings.
- 8-6. Weather protection, temporary protection, and temporary heat as required to perform the work and maintain the project schedule.
- 8-7. Scaffolding as required to complete the work.
- 8-8. Layout of the work including responsibility for all elevations and dimensions as they affect other Contractor's work.
- 8-9. Provide masonry lintels either required by this Contract or install loose lintels furnished by others. 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.

- 8-10. Fill at hollow concrete masonry units.
- 8-11. Furnish and install reinforcing steel in block walls.
- 8-12. Provide sheet waterproofing behind CMU walls as shown.
- 8-13. Temporary protection for final wash down/cleaning of masonry.
- 8-14. Flashing Summary:
 - a. Masonry Contractor shall furnish and install thru wall flashing at all masonry walls. Provide flashing with integral receiver for counterflashing where specified. The Masonry Contractor will furnish the counterflashing to the Roofing Contractor for installation.
 - b. Roofing Contractor shall furnish reglets for installation by the Masonry Contractor. The counterflashing for these reglets will be installed by the Roofing Contractor.
- 8-15. Cutting, fitting and building into masonry work, embedments provided by others.
- 8-16. Provide all firesafing and fire caulking as required. Work related to masonry work.
- 8-17. Furnish masonry veneer anchors to Exterior Structural Stud Contractor for installation.
- 8-18. Bond beams including reinforcing and fill.
- 8-19. Furnish and install all masonry veneer anchors where required.
- 8-20. Grout all CMU blocks where supplemental steel brace and angles are to be attached to the CMU walls. The exact location must be coordinated with the Structural Steel Contractor.
- 8-21. The Masonry Subcontractor will be responsible for the disposal of masonry debris offsite.
- 8-22. Grout solid the existing CMU jambs where new door frames are to be installed.
- 8-23. Patch existing CMU walls in existing areas where demolition was performed as shown on the architectural, mechanical, plumbing and electrical drawings.
- 8-24. Provide Alternate pricing to rake and seal the masonry joints for Alternate No. 6. See the Bid Pack 'A' drawings dated 4-15-13.
- 8-25. Provide in the base bid \$5,000 allowance for work as directed by the Construction Manager

CONTRACT NO. B-09 - 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 07 53 00	Elastomeric Membrane Roofing
Section 07 54 00	Thermoplastic Membrane Roofing
Section 07 62 00	Sheet Metal Flashing and Trim
Section 07 72 00	Roof Accessories
Section 07 90 05	Joint Sealers

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

- 9-1. Provide single ply flexible roofing systems, including rigid and tapered insulation and all related accessories.
- 9-2. Modify existing EPDM Roof as required to for the installation of new HVAC equipment and Penthouse Stairs as per Bid Pack 'A' drawings dated 4-15-13.
- 9-3. Patch and repair the existing ballasted EPDM where the new mechanical equipment is being installed in the Bid Pack 'A' area. Provide Alternate roof pricing per Bid Pack 'A' drawings dated 4-15-13. The Roofing Contractor will be responsible for all demolition associated with this alternate.
- 9-4. Caulking related to roofing, flashing and roof accessories.
- 9-5. Roof drains and associated plumbing shall be provided by the Mechanical Contractor. Flashing of the roof drains shall be by the Roofing Contractor. Openings for the roof drains in the roofing materials shall be cut by the Roofing Contractor. Openings in the metal deck shall be cut by others.
- 9-6. Perform cutting, patching and maintenance of temporary patch for work performed by others on existing roofs intended to be re-roofed as part of this work.
- 9-7. Provide metal drip edges and gravel stops.
- 9-8. Provide roof hatches, smoke hatches, smoke vents and associated roof curbs.
- 9-9. Provide expansion joints that are integral to the roof.

- 9-10. Provide permanent patching of existing roofing systems at areas of demolition. Demolition of roof drains, mechanical and electrical equipment shall be performed by others. All patching shall conform to original warranty requirements and documents.
- 9-11. Provide through wall metal scuppers and related work. This includes cutting and patching the existing walls.
- 9-12. Wood blocking shall be provided by others.
- 9-13. Provide flashing and sheet metal.
- 9-14. Flashing Summary:
- a. Masonry Contractor shall furnish and install thru wall flashing at all masonry walls. Provide flashing with integral receiver for counterflashing where specified. The Masonry Contractor will furnish the counterflashing to the Roofing Contractor for installation.
 - b. Roofing Contractor shall furnish reglets for installation by the Masonry Contractor. The counterflashing for these reglets will be installed by the Roofing Contractor.
- 9-15. Provide in the base bid \$5,000 allowance for work as directed by the Construction Manager.

CONTRACT NO. B-10 - STRUCTURAL STEEL & MISC. 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 05 12 00	Structural Steel Framing
Section 05 31 00	Steel Decking
Section 05 50 00	Metal Fabrications
Section 05 51 00	Metal Stairs
Section 05 52 13	Pipe and Tube Railings
Section 05 53 05	Metal Gratings and Floor Plates
Section 05 71 13	Fabricated Spiral Stairs

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

- 10-1. Provide structural steel, metal floor decking, and roof decking.
- 10-2. Provide supplementary steel for Auditorium roof top units HRU-1 & ACC-1 per Bid Pack A dwg. S-101 dated 4/15/13.
- 10-3. Provide lintels per Bid Pack A dwg. S-101 dated 4/15/13.
- 10-4. Remove existing access Ladder at Elevator Penthouse & Provide aluminum access stair & landing w/ guardrails & handrails per Bid Pack A dwg. A-421.
- 10-5. Remove existing roof ladder, sandblast rust, prep, prime and paint. Provide sealant type 1 in existing anchor holes. Install roof ladder in new location as indicated on Bid Pack A dwg. A-431.
- 10-6. Furnish anchor bolts and leveling plates to the Concrete Contractor for placement in concrete piers.
- 10-7. Field check all anchor bolts prior to beginning erection.
- 10-8. Framing out for openings (mechanical openings, stairs, etc.). Assume opening frames will be field installed.
- 10-9. Prime paint systems, galvanizing, and related finishing of steel items, including touch up.

- 10-10. Masonry or precast anchors welded to steel columns and beams. 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.
- 10-11. Supply and install shear studs.
- 10-12. All steel testing will be the responsibility of the Construction Manager, however, this Contractor will cooperate with the testing agency in the inspection at the fabrication shop and in the field.
- 10-13. Layout, installation and alignment of attachments at the slab edge condition.
- 10-14. No electrical power for welders will be provided.
- 10-15. 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.
- 10-16. This Contractor shall fabricate, weld and install all reinforcing anchors that connect the structural steel to the masonry systems. Provide all shop fabrication, a field installation and field welding regardless of the weld symbols.
- 10-17. This Contractor shall include all necessary staging, rigging, matting and remobilizations to accommodate this erection sequence.
- 10-18. Provide stairs, loose lintels, handrails (fixed and removable), railings, steel ladders and accessories.
- 10-19. Furnish loose steel lintels, angles, plates and embedded items to the Concrete or Masonry contractors.
- 10-20. Miscellaneous rough hardware, iron shapes, framing and support angles.
- 10-21. Reinstall diamond plate that was removed and stored by the Demolition Contractor.
- 10-22. Provide metal gratings and floor plates
- 10-23. Provide stage grid-iron framing
- 10-24. Provide fabricated spiral stairs
- 10-25. Provide louvered equipment enclosures
- 10-26. Provide overhead door frames.

10-27. Galvanizing, as required.

10-28. Anchoring devices, fasteners, inserts and other related items associated with the installation of the above items.

10-29. Field touch-up paint.

10-30. Verify field dimensions.

10-31. Smoke eaters must be utilized at all areas where welding or torch work is required. These must be utilized at all welds.

10-32. Provide patching of existing metal roof deck where existing mechanical and plumbing equipment is being removed. Also patch the existing metal roof deck where new mechanical equipment, frames, post, etc. are being installed.

10-33. Provide in the base bid \$10,000 allowance for work as directed by the Construction Manager.

CONTRACT NO. B-11 – 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 05 40 00	Cold-Formed Metal Framing
Section 07 21 00	Thermal Insulation
Section 07 90 05	Joint Sealers
Section 09 21 16	Gypsum Board Assemblies

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

- 11-1 Provide metal studs, insulation, gypsum wallboard, taping, spackling, and finishing. Provide all metal framing as indicated for back up of other materials.
- 11-2 Provide gypsum ceiling soffits
- 11-3 Batt insulation, both thermal and acoustical and related work.
- 11-4 Acoustical sealant of penetrations in insulated drywall partitions.
- 11-5 Access panel installation
- 11-6 Installation only of hollow metal frames in all drywall partitions.
- 11-7 Include filling of all interior hollow metal door frames in drywall where required.
- 11-8 Include fire taping and sealing at perimeter edge and as shown on the Drawings.
- 11-9 Scaffolding and lifts for this work.
- 11-10 Comebacks and out-of-sequence work may be required and as such should be included.
- 11-11 Include all necessary field measurements.
- 11-12 Include two (2) passes to “touch-up” mechanical penetrations to insure 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.

11-13 Bidders are advised to pay particular attention to top of wall conditions, fire and smoke safing of slabs and acoustical sealants.

11-14 Provide metal furring.

11-15 Provide in the base bid \$5,000 allowance for work as directed by the Construction Manager

CONTRACT NO. B-12 - PAINTING

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 90 05	Joint Sealers
Section 09 90 01	Paints and Coatings

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

- 12-1 Provide all painting and vinyl or fabric wall covering (all walls and ceilings indicated on the finish schedule).
- 12-2 Sealing all interior joints between dissimilar materials that require sealants.
- 12-3 Paint all exposed block work and concrete work as shown on the room finish schedule.
- 12-4 Prime, stain or seal all wood trim and doors.
- 12-5 Paint exposed piping and ductwork (sprinkler, plumbing, electrical) in accordance with the Drawings and Specifications.
- 12-6 Provide supplementary ventilation as required in enclosed spaces.
- 12-7 Paint and caulk all hollow metal frames and doors as shown on the door schedule.
- 12-8 Paint metal stairs and railings.
- 12-9 Prefinished items will not be painted by this Contractor.
- 12-10 Paint all semi-exposed wood blocking as indicated on the drawing.
- 12-11 Protection of adjacent surfaces.
- 12-12 Minor patching prior to application of finishes.
- 12-13 Provide concrete stain and floor sealer as noted on the finish drawings.

12-14 Provide specialty coatings as noted on the finish drawings.

12-15 Clean up.

12-16 This Contractor to allow 40 man hours and all required paint materials for these man hours to be used as directed by the Construction Manager.

12-17 Attic stock.

12-18 Final coat of paint is to be installed after ceilings are installed, if directed by Construction Manager.

CONTRACT NO. B-13 – 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	Procurement and Contract Requirements
Division 1	General Requirements
Section 07 90 05	Joint Sealers
Section 09 51 00	Acoustical Tile Ceilings
Section 09 54 00	Acoustical Wood Panels

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

- 13-1. Provide acoustical panel ceilings, suspension system and hangers.
- 13-2. Provide acoustical wood wall panels.
- 13-3. Provide supplemental suspension hangers at large ducts above ceilings and at openings for lighting fixtures.
- 13-4. Provide continuous acoustical sealant on back of vertical leg before installing moldings.
- 13-5. Furnish and install hold down clips where required by governing regulations for fire resistant ratings.
- 13-6. Provide expansion joints in ceilings.
- 13-7. This Contractor shall cut openings in ceilings for sprinkler heads, lights, mechanical diffusers and grilles, etc.
- 13-8. Provide extra stock.
- 13-9. Provide in the base bid \$5,000 allowance for work as directed by the Construction Manager.

CONTRACT NO. B-14 - 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 09 05 61	Common Work Results for Flooring Preparation
Section 09 30 00	Tiling
Section 09 65 00	Resilient Flooring
Section 09 65 66	Resilient Dance Flooring
Section 09 66 13	Portland Cement Terrazzo Flooring
Section 09 68 00	Carpeting
Section 09 68 13	Tile Carpeting

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

- 14-1. Provide flooring in accordance with the finish schedule and specifications.
- 14-2. 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.
- 14-3. Provide finish floor in elevator cab per Bid Pack A, Dwg A-421, Elevator Cab Keynote 1.
- 14-4. Provide resilient flooring and base
- 14-5. Provide resilient dance flooring
- 14-6. Provide portland cement terrazzo flooring to match existing
- 14-7. Provide carpeting.
- 14-8. Provide tile carpeting.
- 14-9. Provide ceramic tile, setting beds, and marble thresholds. Provide skim coating of CMU in order to prepare the new or existing walls to receive ceramic tile.
- 14-10. Provide resilient transition and reducer strips at edges of resilient flooring and at edges of carpeting.
- 14-11. Provide cleaning, waxing and protection. Protection will be with reinforced kraft paper,

cardboard, or masonite.

14-12. Provide seaming diagrams.

14-13. Provide attic stock.

14-14. Provide cutting and fitting around work of others.

14-15. Wood strip flooring and stage flooring is not part of this contract.

14-16. Provide in the base bid \$5,000 allowance for work as directed by the Construction Manager.

CONTRACT NO. B-15 – STAGE RIGGING AND 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	Procurement and Contract Requirements
Division 1	General Requirements
Section 11 61 13	Acoustical Shell System
Section 11 61 23	Orchestra Pit Filler System
Section 11 61 33	Stage Rigging and Draperies

- 15-1. Provide acoustical shell system for the auditorium stage, acoustical shell panels, mobile acoustical towers, adjustable acoustical shell ceiling.
- 15-2. Provide orchestra pit filler system.
- 15-3. Provide stage rigging equipment, stage drapery tracks and battens, fall arrest systems, manual counterweight line sets, motorized counterweight assist line sets, fire safety curtain rigging,
- 15-4. Provide draperies, curtains, skydrop, scenic drops, and scrims.
- 15-5. Provide curtain machines and rigging controls. Rigging controls to fit in 9U space in A/V rack.
- 15-6. Provide auditorium acoustical curtains and tracks.
- 15-7. Provide auditorium side torm lighting ladders.
- 15-8. Provide signage associated with the work of this contractor.
- 15-9. Provide training, commissioning, and inspection of completed systems.
- 15-10. Furnish and install structural steel supports and any necessary auxiliary steel required for the proper attachment of motorized hoist and stage equipment to structure over auditorium and stage areas.
- 15-11. Furnish and install any requisite auxiliary steel in T.V. studio required to properly support grid in locations as indicated on the contract drawings.
- 15-12. Provide in the base bid \$5,000 allowance for work as directed by the Construction Manager

CONTRACT NO. B-16 – AUDITORIUM SEATING

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	Procurement and Contract Requirements
Division 1	General Requirements
Section 12 61 16	Fixed Audience Seating

16-1. Provide floor mounted fixed audience seating.

16-2. Provide ADA easy access armrests.

16-3. Provide removable chairs in the quantities and at the locations shown.

16-4. Field Measurements: Coordinate actual dimensions of construction affecting fixed upholstered chair seating installation by accurate field measurements before fabrication. Coordinate field measurements and fabrication schedule with construction progress to avoid delay of Work.

16-5. Provide extra materials

16-6. Provide in the base bid \$5,000 allowance for work as directed by the Construction Manager

CONTRACT NO. B-17 - MECHANICAL AND PLUMBING - THEATER

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 22	Plumbing
Division 23	Heating, Ventilating, & Air Conditioning
Division 26	Electrical
Section 03 30 00	Cast-In-Place Concrete

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

- 17-1 Provide a complete mechanical, plumbing and piping system as indicated on the Drawings and in the Specifications.
- 17-2 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.
- 17-3 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.
- 17-4 Excavation and backfill for underground mechanical/plumbing work as detailed below is the responsibility of this Contractor. Soil types shall be in accordance with project documents. It is the intent to use on site material and not imported fill.
- 17-5 Provide equipment bases and housekeeping pads.
- 17-6 Provide permits/meters.

- 17-7 Provide pipe and duct insulation.
- 17-8 Provide penetrations through wall, floors, etc. including cutting, patching and fire safing.
- 17-9 Provide daily clean up.
- 17-10 All guarantees and warranties to begin at the substantial completion of the entire project regardless of when the manufacturer states the warranty begins. The contractor is required to provide extended warranties as necessary. Maintain equipment prior to substantial completion.
- 17-11 Hoisting, rigging and scaffolding.
- 17-12 Provide automatic temperature controls.
- 17-13 Provide ductwork, flex duct, grilles and diffusers.
- 17-14 Provide roof drains.
- 17-15 Provide louvers and vents related to HVAC operations.
- 17-16 Coordinate damper size, location and type of damper with architectural drawings.
- 17-17 Temporary heat and ventilation installation, maintenance and removal. Refer to Division 1, Specification section 015123 - TEMPORARY HEAT AND VENTILATION, for specific scope.
- 17-18 Gas piping, meter and pressure regulator valve.
- 17-19 Provide trap priming system.
- 17-20 Provide eye wash station
- 17-21 Provide roof curbs.
- 17-22 Provide access panels.
- 17-23 Provide final connection of equipment and appliances.
- 17-24 Provide a factory authorized representative for start-up and commissioning of all systems.
- 17-25 Provide training to Owner prior to substantial completion
- 17-26 Provide as-built drawings in CAD format

- 17-27 Saw cut and remove concrete slab as required for mechanical & plumbing work.
- 17-28 This contractor shall identify, cut and cap all mechanical and plumbing systems associated with the demolition. The Demolition Contractor shall remove the mechanical & plumbing systems as identified by this Contractor.
- 17-29 Provide Alternate pricing to replace roof drains per note 6 on Bid Pack A dwg A-431.
- 17-30 Attend Pre-Install, Functional Performance Testing, Start-up, Pre-Commissioning, and Commissioning coordination meetings and provide relative input. Provide personnel, both tradesmen and factory authorized representatives, to participate in the testing, adjusting, and balancing; functional performance testing; and final commissioning.
- 17-31 Provide in the base bid \$5,000 allowance for work as directed by the Construction Manager.

CONTRACT NO. B-18 – ELECTRICAL, FIRE ALARM, & 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	Procurement and Contract Requirements
Division 1	General Requirements
Division 22	Plumbing
Division 23	Heating, Ventilating, & Air Conditioning
Division 26	Electrical
Section 03 30 00	Cast-In-Place Concrete
Section 27 41 18	Sound and Video Systems

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

18-1. Provide a complete electrical system as indicated on **Bid Pack A** drawings, schedules and in the specifications, excluding all work associated with Toilet Rooms 243 & 247. This work includes but not limited to:

- Remove Existing Elevator Pit Light.
- Remove outlet in Elevator Pit.
- Remove Electrical / Data Wiring / Equipment not related to Elevator.
- Provide Elevator Pit Light.
- Provide outlet in Elevator Pit.
- Replace existing elevator machine disconnect with new.
- Provide electrical service to new elevator.
- Provide new disconnect switch for elevator lighting.
- Provide new lighting in elevator machine room.
- Provide new fire alarm devices in the elevator shaft, machine room and outside elevator at each floor.
- Provide new 800 amp fuse disconnect for the fire pump. To include conduit & wiring from disconnect to fire pump controller.
- Furnish (2) fire alarm system duct detectors for the Pool Pak Unit HRU-1 to the mechanical contractor for installation. Upon completion this contractor shall connect the fire alarm control panel for unit shutdown.
- Provide fused weather proof disconnects and electrical service for Units ACC-1 & PTHP-1.
- Provide electrical service to Natatorium Unit, HRU-1.
- Provide electrical service to new elevator pit sump pump, control panel & oil sensor.
- Provide power and toggle switch for Exhaust Fan EF-1
- Disconnect existing Natatorium Air Handler. See note 1 on E-102
- Provide convenience receptacle at ACC-1.

- s. Provide new circuit breakers in existing panel RDP-4 for new equipment.
 - t. Disconnect, remove or relocate existing devices in the corridors per notes on dwg. E-201, E-202 & E-203.
- 18-2. Provide a complete electrical system as indicated on **Bid Pack B** drawings, schedules and in the specifications.
- 18-3. Divisions 22 and 23 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 and controllers as detailed in the Specifications and on the Drawings.
- 18-4. Excavation and backfill for underground electrical work as detailed below is the responsibility of this Contractor. Soil types shall be in accordance with project documents. It is the intent to use on site material and not imported fill.
- 18-5. Temporary electric installation, maintenance and removal. Refer to Division 1, specification section 015113 - TEMPORARY ELECTRIC, for specific scope.
- 18-6. Provide rough-in and final connections and related work for equipment provided under other contracts (i.e. HVAC, sprinkler, motorized doors, owner furnished equipment, etc.). Provide power to automatic hardware. Low voltage wiring from the controller to hardware shall be furnished and installed by the Carpentry and General Works Contractor.
- 18-7. Obtain permits as required.
- 18-8. Provide penetrations through walls, floors, etc. including sleeves, link seals, cutting, patching and fire safing.
- 18-9. Provide daily clean up.
- 18-10. All guarantees and warranties to begin at the substantial completion of the entire project regardless of when the manufacturer states the warranty begins. The contractor is required to provide extended warranties as necessary. Maintain equipment prior to substantial completion.
- 18-11. Provide hoisting, rigging and scaffolding.
- 18-12. Provide new fire alarm devices connected to the existing fire alarm system. Coordinate with the Owners existing fire alarm system vendor (SimplexGrinnell). Expand the existing system to cover the renovated areas, new elevator, new Pool Pak, new fire pump controller and the flow & tamper switches for the sprinkler system. Water flow devices are supplied and installed by the Sprinkler Contractor and wired by this Contractor. Include tie-in to fire sprinkler flow and tamper switches for both Bid Pack A & Bid Pack B.

- 18-13. Provide grounding of building columns and interior spaces as required.
- 18-14. Provide new automatic transfer switch connected to existing emergency generator.
- 18-15. Provide complete tune-up service on existing 208/120V, 3 phase, 100KW, Olympian natural gas generator. Coordinate and pay for all work with local Ransome dealer. Provide new battery and 4 hour load test.
- 18-16. Provide vibration controls for electrical systems.
- 18-17. Provide transient voltage suppression.
- 18-18. Provide stage and theater lighting systems including fixtures, controls, wiring, light grids, supports and attachments. Coordinate the work with the Stage Rigging Contractor. See Section 116133 Stage Rigging and Draperies for items of work specifically assigned to the Electrical Contractor.
- 18-19. Provide complete sound and video systems
- 18-20. Provide conduits, raceways, boxes, and pull strings for telephone and data systems. The wiring and devices will be installed by others.
- 18-21. Provide access panels in GWB and CMU walls.
- 18-22. Attend Pre-Install, Functional Performance Testing, Start-up, Pre-Commissioning, and Commissioning coordination meetings and provide relative input. Provide personnel, both tradesmen and factory authorized representatives, to participate in the testing, adjusting, and balancing; functional performance testing; and final commissioning.
- 18-23. Provide testing and inspections as required by the specifications
- 18-24. Provide a factory authorized representative for start-up and commissioning of all systems.
- 18-25. Provide training to Owner prior to substantial completion
- 18-26. Provide as-built drawings in CAD format
- 18-27. Provide in the base bid \$5,000 allowance for work as directed by the Construction Manager.
- 18-28. This contractor shall clearly identify and de-energize all electrical, fire alarm & specialty systems associated with the demolition. The Electrical Contractor will provide written confirmation to the CM once the systems are safed-off. The Demolition Contractor shall remove the electrical, fire alarm & specialty systems as identified by this Contractor.

CONTRACT NO. B-19 – TESTING, ADJUSTING & 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 22 01 91	Balancing – Plumbing
Section 23 09 50	Testing & Balancing of Mechanical Systems

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

- 19-1 This Contractor must be certified by AABC, NEBB, or TABB.
- 19-2 Perform the testing, adjusting and balancing of the Plumbing Systems to meet optimum performance capabilities within design parameters, sequence of operations and installation limits.
- 19-3 Perform the testing, adjusting and balancing of the Air Systems to meet optimum performance capabilities within design parameters, sequence of operations and installation limits.
- 19-4 Perform the testing, adjusting and balancing of the Hydronic Piping Systems to meet optimum performance capabilities within design parameters, sequence of operations and installation limits.
- 19-5 Perform testing, adjusting and balancing of HVAC equipment to verify quantitative-performance settings.
- 19-6 The TAB Contractor will witness the testing conducted by the Mechanical Contractor per Section 23 06 00.
- 19-7 Make at least two inspections of the mechanical systems during construction to verify that balancing procedures may be accomplished. Report findings to the Construction Manager.
- 19-8 Balance the Mechanical System two (2) times. The first time shall be considered a rough balance. Any discrepancy in air flow shall be addressed to the Construction Manager. The final balancing will be accomplished after review of rough balance reports.
- 19-9 Verify that automatic control devices are functioning properly. Balancer must provide verification of actual control sensor versus actual readings performed during balancing and report any deficiencies at the time of the functional verification.

- 19-10 Provide an initial TAB of the air and hydronic systems while the systems are being started.
- 19-11 Provide the final TAB after the mechanical systems and ATC systems are completed.
- 19-12 Attend Pre-Install, Functional Performance Testing, Start-up, Pre-Commissioning, and Commissioning coordination meetings and provide relative input. Participate in the functional performance testing and final commissioning. Coordinate and cooperate with the Independent Commissioning Agent. The balancer shall include the costs for a pre-commissioning meeting with all MEP related trades prior to mobilization as well as additional follow up meetings required to discuss, coordinate and execute any changes required based on balancing findings.
- 19-13 Prepare and issue TAB reports in timely manner. Provide a working (Pencil) copy of all preliminary readings to the Construction Manager within 5 working days from the date in which the testing and balancing occurs. Provide final written report within 10 working days of substantial completion.
- 19-14 Provide daily hand written field reports with any deficiencies to the CM.
- 19-15 The TAB may not be performed during near-peak summer or winter conditions. Perform additional inspections, testing, adjusting and balancing during near-peak summer and/or winter conditions. This will require remobilization.
- 19-16 Coordinate and cooperate with the Mechanical, Plumbing & ATC Contractors for the balancing work.
- 19-17 After testing and balancing, close probe holes and patch insulation with new materials identical to those removed.

END OF SECTION

SECTION 012100 - ALLOWANCES

1. RELATED DOCUMENTS

- 1.1 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.
- 1.2 Refer to provisions in AIA Document A232 – 2009 EDITION, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, CONSTRUCTION MANAGER AS ADVISOR EDITION, for requirements in addition to those specified in Division 1.
- 1.3 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.
- 1.4 For work being constructed under separate prime contracts, provisions of this Section apply to each contract being bid.
- 1.5 Include in the Contract Sum all lump sum and unit cost allowances stated in the Contract Documents.
- 1.6 Designate in the construction progress schedule the delivery dates for products specified under each allowance.
- 1.7 Designate in the Schedule of Values the quantities of materials required under each unit cost allowance.

2. ALLOWANCES FOR PRODUCTS

- 2.1 The amount of each allowance includes:
 - A. The cost of the product or labor to the Contractor or Subcontractor, less any applicable trade discounts.
 - B. Delivery to the site.
 - C. Labor required under the allowance, only when labor is 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.
 - D. Applicable taxes.

- E. Profit and overhead.
- 2.2 In addition to the amount of each allowance, include in the Contract Sum the Contractor's costs for:
- A. Handling at the site; including unloading, uncrating and storage.
 - B. Protection from the elements and from damage.
 - C. Labor for installation and finishing, except where labor is specified to be a part of the allowance.
 - D. Other expenses required to complete the installation.
 - E. Contractor's and Subcontractor's overhead and profit.
- 2.3 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.
- A. B-05 Demolition
 - 1. \$10,000 for miscellaneous demolition work.
 - B. B-06 Concrete
 - 1. \$5,000 for miscellaneous concrete work.
 - C. B-07 Carpentry & General Works
 - 1. 120 hours Carpenter's time.
 - 2. 120 hours Laborer's time.
 - 3. (1) Fire Extinguisher for every 3,000 SF of protected building area.
 - 4. \$10,000 miscellaneous carpentry work.
 - D. B-08 Masonry
 - 1. \$5,000 for miscellaneous masonry work.
 - E. B-09 Roofing
 - 1. \$5,000 for miscellaneous roofing work.
 - F. B-10 Structural Steel & Misc. Metals
 - 1. \$10,000 for miscellaneous steel work.
 - G. B-11 Metal Studs and Drywall
 - 1. \$5,000 for miscellaneous concrete work.

- H. B-12 Painting
 - 1. 40 hours of Painter's time
- I. B-13 Acoustical Ceilings
 - 1. \$5,000 for miscellaneous acoustical ceiling work.
- J. B-14 Flooring
 - 1. \$5,000 for miscellaneous flooring work.
- K. B-15 Stage Rigging
 - 1. \$5,000 for miscellaneous stage rigging work.'
- L. B-16 Auditorium Seating
 - 1. \$5,000 for miscellaneous auditorium seating work.
- M. B-17 Mechanical & Plumbing – Theater
 - 1. \$5,000 for miscellaneous mechanical or plumbing work.
- N. B-18 Electrical, Fire Alarm & Specialty Systems
 - 1. \$5,000 for miscellaneous concrete work.

3. ADJUSTMENT OF COSTS

- 3.1 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.
 - A. 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.
- 3.2 At Contract closeout, reflect all approved changes in Contract amounts in the final statement of accounting.

END OF SECTION

SECTION 012300 - ALTERNATES

1. GENERAL PROVISIONS

- 1.1 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.
- 1.2 Refer to provisions in AIA Document A232 – 2009 Edition, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, CONSTRUCTION MANAGER AS ADVISOR EDITION, for requirements in addition to those specified in Division 1.
- 1.3 For work being constructed under separate prime contracts, provisions of this Section apply to each contract being bid.

2. BASE BID

- 2.1 The Base Bid shall consist of all work shown or specified in the Contract Documents, exclusive of any Additive Alternates specified herein.
- 2.2 The Base Bid shall include all work in any Subtractive Alternates specified herein.

3. ALTERNATES

- 3.1 State in the Bid Form the amount to be added to the Base Bid for each Alternate specified.
- 3.2 See Section 002113 - INSTRUCTIONS TO BIDDERS for related information.
- 3.3 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: Add Relocation of Instrumental Classroom Corridor

- a. Base Bid: No work is required.
- b. Alternate: Includes, but is not limited to, relocating the instrumental classroom corridor.

Alternate No. 2: Add (6) Additional Intelligent Light Fixtures.

- a. Base Bid: No work is required.
- b. Alternate: Includes, but is not limited to, adding 6 additional intelligent light fixtures in the theater.

Alternate No. 3: Add LED Ground Row Cyclorama Fixtures

- a. Base Bid: No work is required.
- b. Alternate: Includes, but is not limited to, adding LED ground row cyclorama fixtures in the theater.

Alternate No. 4: Upgrade to Seamless Plastic (PVC) Cyclorama

- a. Base Bid: No work is required.
- b. Alternate: Includes, but is not limited to, upgrading the cyclorama to (Gerriets "Opera" or Rosco "Twin White")

Alternate No. 5: Add Acoustical Banners

- a. Base Bid: No work is required.
- b. Alternate: Includes, but is not limited to, adding adjustable acoustical banner system in the theater

Alternate No. 6: Replace Roofing in Bid Pack 'A' Area

- a. Base Bid: Patch and repair roof associated with the installation of new roof HVAC equipment shown on the bid pack 'A' documents.
- b. Alternate: Includes, but is not limited to, removing the entire existing ballasted EPDM roofing system and insulation down to existing deck. Provide new TPO membrane roofing system with tapered insulation (3" minimum) and ½" cover board.

END OF SECTION

SECTION 012600 - CHANGE ORDER PROCEDURES

1. GENERAL:

- 1.1 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.
- 1.2 Refer to provisions in AIA Document A232 – 2009 EDITION, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, CONSTRUCTION MANAGER AS ADVISOR EDITION, for requirements in addition to those specified in Division 1.
- 1.3 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.
- 1.4 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:

- 2.1 Specific changes initiated by the Owner, Architect, Construction Manager (CM) or Contractor will be processed as follows:
 - A. 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.
 - B. 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.
 - C. 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.

- 2.2 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:
- 3.1 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.
- 3.2 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.
- 3.3 In all cases, this cost or credit shall be based on the "DPE" wages required and the "invoice price" of the materials/equipment needed.
- 3.4 "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.
- A. "Fringe Benefit" is any medical, life or disability insurance, paid time off, etc.
- B. "Worker's Compensation" is the insurance required for injuries including medical leave, etc.
- C. "FICA" is the costs association with Social Security and Medicare insurance.
- D. "Unemployment insurance" is the cost associated with the governmental assessment for employee's unemployment benefits.
- 3.5 "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.
- 3.6 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.
- 3.7 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:

- A. 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".
- B. 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.
- C. 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".
- D. 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.
- E. 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: Signed By: Title: Date:	_____ Architect: Signed By: Title: Date:	
_____ EDiS Company Signed By: Title: Date:	_____ Owner: Signed By: Title: Date:	



CHANGE ORDER DETAIL FORM

(Provided by contractor, subcontractor or sub tier contractor)

DATE SUBMITTED:

CONTRACT:

CONTRACTOR:

PROJECT NAME: WILMINGTON CAMPUS RENOVATIONS

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: WILMINGTON CAMPUS RENOVATIONS

CHANGE ORDER REQUEST #:

CLASSIFICATION:			
Base Wage Rate:			
Health Insurance			
Holidays			
Sick Days			
Life Insurance			
Disability Insurance			
Dental Insurance			
Company Vehicle			
401K			
Education			
Other (<i>specify below</i>)			
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

- 1.1 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.

- (a) 15% mark-up (10% overhead and 5% profit) by the Contractor on Work performed by his own forces.
 - (b) 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.
 - (c) Contractor mark-up shall include supervision, home and field overhead, all self-owned small tools and equipment.
- 1.2 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

- 1.1 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.
- 1.2 Refer to provisions in AIA Document A232 - 2009 Edition, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, CONSTRUCTION MANAGER AS ADVISOR EDITION, for requirements in addition to those specified in Division 1.
- 1.3 For work being constructed under separate prime contracts, provisions of this Section apply to each contract being bid.

2. REQUIREMENTS INCLUDED

- 2.1 Submit Applications for Payment to Construction Manager in accordance with the schedule and procedures established in the Contract Documents.

3. RELATED REQUIREMENTS

- 3.1 Owner-Contractor Agreement.
- 3.2 Conditions of the Contract: Article 9 PAYMENTS AND COMPLETION.
- 3.3 Section 01 31 13: Project Coordination Meetings
- 3.4 Section 01 33 00: Submittal Procedures
- 3.5 Section 01 77 00: Closeout Procedures

4. FORMAT AND DATA REQUIRED

- 4.1 Submit itemized applications typed on AIA Document G702/CMA, Application and Certificate for Payment, and Continuation Sheet G703, examples of which will be furnished to the Contractor at the Pre-Construction meeting.
- 4.2 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

5.1 Form: AIA Document G702/CMA

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.

5.2 Continuation Sheets:

1. Line items of components of Work will be subject to 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.

6. PREPARATION OF APPLICATION FOR FINAL PAYMENT

- 6.1 Fill in Application form as specified in progress payments.

7. SUBMITTAL PROCEDURES

7.1 Complete Invoice:

1. Submit completed Application to the Construction Manager by the date stipulated in the Project Manual.

- 7.2 Number: Submit 3 copies of each invoice.

END OF SECTION

SECTION 013113 - PROJECT COORDINATION MEETING

1. PROJECT COORDINATION MEETING

1.1 An on-site project coordination meeting will be held on a biweekly basis throughout the project construction period.

2. ATTENDANCE

2.1 Attendance at the project coordination meeting is mandatory of each Contractor or major supplier on the project.

2.2 The representative of the Contractor shall be the Project Manager and field superintendent, unless a substitute representative has been approved by the Construction Manager.

2.3 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.

2.4 EDiS will prepare meeting minutes and distribute them to all of the contractors. Each contractor is required to review the meeting minutes and follow-up on items assigned. Each contractor will be responsible for disseminating information discussed during these meetings to their field personnel, subcontractors, and suppliers.

3. AGENDA

3.1 The Construction Manager will set the agenda for the biweekly Project Coordination Meeting.

3.2 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. Requests for Information (RFI's).
10. Other items requiring Construction Manager's attention.

END OF SECTION

SECTION 013119 – PRE-INSTALLATION MEETINGS

1. PRE-INSTALLATION MEETINGS

1.1 An on-site pre-installation meeting will be held at least two weeks prior to commencement of installation of work.

2. ATTENDANCE

2.1 Attendance at the pre-installation meeting is mandatory of each Contractor and/or major supplier as required for each specific meeting listed below.

2.2 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

3.1 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

- 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
- Doors/Frames/Hardware
- Interior Glass and Glazing
- Finish Carpentry & Millwork
- Acoustical Ceilings/Acoustical Wall Panels

- Paint and VWC
- Ceramic Tile
- Flooring (VCT, Carpet)
- Terrazzo Flooring
- Elevators
- Partition Walls
 - Metal Studs
 - Drywall
 - Insulation
 - Doors/Frames/Hardware
- Elevators
- Fire Protection
 - Fire Sprinkler Systems
- MEP Coordination
 - Mechanical Piping Roughin
 - Plumbing Roughin
 - Insulation
 - Electrical Roughin
 - Electrical – Bonding, grounding, lightning protection
 - Automatic Temperature Controls
 - Commissioning
- Voice/Data Low Voltage Wiring
- Security System
- Audio-Visual Equipment
- Owner Furnished Equipment
- Final Cleaning

5. AGENDA

- 5.1 At a minimum, the Contractor shall be prepared to discuss the items as listed on the agenda template shown on the following page:

PROJECT: WILMINGTON CAMPUS RENOVATIONS

PRE-INSTALLATION MEETING: (Insert Phase of Work)

- A. INTRODUCTIONS
- B. REVIEW SCOPES OF WORK
- C. REVIEW CONTRACT DRAWINGS AND SPECIFICATIONS
- D. REVIEW SUBMITTALS
- E. TESTING & INSPECTION REQUIREMENTS
- F. REVIEW RELEVANT RFI'S OR DESIGN BULLETINS
- G. REVIEW MATERIALS AND DELIVERIES
- H. REVIEW SCHEDULE AND SEQUENCE OF WORK
- I. JOB SITE SAFETY
- J. COORDINATION WITH OTHER TRADES
- K. CLOSEOUT
- L. ACTION ITEMS AND RESPONSIBILITY

END OF SECTION

SECTION 013125- WEB-BASED PROJECT MANAGEMENT SYSTEM

1. GENERAL PROVISIONS

- 1.1 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.
- 1.2 Refer to provisions in AIA Document A201 – 2007 EDITION, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, for requirements in addition to those specified in Division 1.
- 1.3 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.
- 1.4 All Contractors shall use Internet/Web-based project management software to transmit documents, track, and otherwise manage this project.
- 1.5 Use of this project management software will not change any contractual responsibilities of the construction team members.

2. DEFINITIONS

- 2.1 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.
- 2.2 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.
- 2.3 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.
- 2.4 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

- 3.1 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.
- 3.2 The use of the system will be mandatory by the Contractors to send, retrieve, and respond to

data.

3.3 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

4.1 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.

4.2 Technical assistance will be provided by on-line help, email, or telephone for all Users throughout the life of the project.

5. SUBMITTALS

5.1 Submit to the Construction Manager, within 5 days following the receipt of the letter of intent to award, in an electronic template, the following:

- a. Electronic logo of organization (as needed)
- b. Names, mailing address and electronic address of its Users and Contacts.
- c. Designation the role/responsibility for each User

6. SOFTWARE AND HARDWARE REQUIREMENTS

6.1 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.

6.2 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

7.1 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.

- 7.2 The system contains a directory of the project participants.
- 7.3 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.
- 7.4 The system allows the templates (and attached documents created outside the system) to be distributed to Users and Contacts.
- 7.5 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.
- 7.6 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.
- 7.7 The system is the product of *Building Blok LLC* (www.buildingblok.com) and will be continuously updated.
- 7.8 The Construction Manager will administer the Building Blok User accounts for this project.

8. DOCUMENTS CREATED INSIDE THE SYSTEM

- 8.1 The following documents shall be created on templates inside the system.
 - a. Transmittals for submittals processed in the system. The transmittals are automatically created by the system when the submittal is uploaded.
 - b. Submittal Register showing all of the submittals required of the contract, assigned to each Contractor.
 - c. Submittal Log: The CM will maintain submittal log after it is initialized.
 - d. RFI (Requests for Information)
 - e. Change Orders
 - f. RFP (Requests for Proposal)
 - g. ASI (Architect's Supplemental Instructions)
 - h. Tasks & Memos as determined by the CM
 - i. Payment Applications
 - j. Closeout Tracking Log

- 8.2 The following documents may, at each Users option, be created on the system.
- a. Morning & Afternoon Activity Reports generated by the system
 - b. E-mails: Contacts that do not have access to the system may be sent information from the system, by the system.
 - c. Reports of information on the system
 - d. Project Notices: "Broadcast" messages can be sent to other Users system entry screen.

9. DOCUMENTS CREATED OUTSIDE THE SYSTEM AND DISTRIBUTED BY THE SYSTEM

9.1 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.

- a. 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.
- b. Photographs: Digital photographs and scanned images can be loaded onto the system and shared.
- d. Schedule of Values/ Payment Applications: (The "pencil" review of these documents can occur inside the system).
- e. Change Orders: (The "pencil" review of these documents can occur inside the system.)
- g. Schedules: The schedule document(s) will be available for review on the system.
- h. Data created in other software may be uploaded to the system electronically.

10. DOCUMENTS CREATED OUTSIDE THE SYSTEM AND DISTRIBUTED OUTSIDE THE SYSTEM

10.1 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.

- a. 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.
- b. 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.
- c. Meeting minutes will be created using Microsoft Word 2003 and distributed through hard copies at meetings or through email.
- d. AIA closeout documents, which require an "original" signature, will be created and distributed outside the system.

END OF SECTION

SECTION 013216 - CONSTRUCTION SCHEDULE

1. PRE-BID CONSTRUCTION SCHEDULE

1.1 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.

1.2 The Pre-Bid Construction Schedule includes allowances for time lost due to adverse and abnormal weather conditions, other than floods, hurricanes, tornadoes, lightning 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.

2. SCHEDULING OF THE WORK AFTER AWARD OF CONTRACT

2.1 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. 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.

2.2 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. The approved Project Construction Schedule shall be issued to the Contractor and the Contractor shall perform his Work in conformity therewith.

- 2.3 The Contractor shall submit proposed schedule revisions and obtain the written approval of the Construction Manager therefore before deviating from the Project Construction Schedule.
- 2.4 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.

3. ADHERENCE TO THE SCHEDULE

- 3.1 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.
- 3.2 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 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.
- 3.3 Each Contractor shall, if directed by the Construction Manager, provide the Construction Manager a 2-week look ahead of anticipated manpower showing the number of men, classification, and anticipated work.

END OF SECTION

SECTION 013219 - SUBMITTAL REGISTER

1. SUBMITTALS/SUBMITTAL REGISTER

- 1.1 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.
- 1.2 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.
- 1.3 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

- 2.1 Submit tagged or labeled samples in triplicate, unless another quantity is otherwise specified by the Construction Manager.
- 2.2 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.

Red Clay Consolidated School District
Wilmington Campus Renovations
Bid Pack B
May 28, 2013

END OF SECTION

SECTION 013226 - SUBCONTRACTOR DAILY REPORTS

1. SUBCONTRACTOR DAILY REPORTS

1.1 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).*

1.2 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

2.1 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.

2.2 A separate Daily Extra Work Report shall be submitted for each separate authorized Extra Work item done on a time and material basis.

2.3 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

3.1 A sample daily report follows this section for your reference.

END OF SECTION



CONTRACTOR'S DAILY REPORT

Project Name: _____

Date: _____

Contractor: _____

Contract No. & Description: _____

Weather: _____

Foreman's Name (Print) _____

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: _____

Qualified Operator(s) _____

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 requirement 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.

Please See Other Side

Below is a general checklist of requirements on this project. Contractors will check off items that pertain to their contract and project tasks. Notify EDis Field Manager of any issues. This checklist is not meant to be all inclusive. Please refer to additional OSHA regulations for compliance.

House Keeping

- Material Storage Area's Orderly
- Trash Containers Available and Emptied daily
- Fire Hazards
- Lighting and ventilation
- Exits and Stair clear passage
- Walkways, corridors clear passage
- Daily debris /trash removal
- _____

Personal Protective Equipment

- Hard Hats being worn
- Safety Glasses with side shields being worn
- Secondary Eye/Face protection
- Respirators as required
- Hand protection when needed
- Ear protection when needed
- Inspected & Maintained
- _____

Fire Prevention

- Fire extinguishers inspected
- Flammable / Combustibles properly store
- Approved Fuel cans used and labeled
- Oxygen / Acetylenes stored properly
- _____

Electrical

- GFI in use
- Three prong insulated extension cords used
- Extension cords in good condition
- Lockout / Tag-out program in use
- _____

Excavations

- Miss Utility been contacted
- Properly Barricaded
- Ladders in use at depths over 4'-0"
- Ladders every 25'-0" distance
- Shored, sloped, benched as required
- Dewatering as needed
- _____

Ladders

- Good condition
- Correct pitch
- Extends 3'-0" above landing
- Open and secured / tied off
- _____

Scaffolds

- Certified Scaffold Installer
- Guardrails, toe boards, and planking secured
- Appropriate signage
- Adequate cross bracing
- Secured to building over 25'-0" in height
- _____

Cranes

- Rated Load Capacity available in cab
- Swing Radius barricaded
- Appropriate certificates / decals / hand signals
- Daily safety inspection log completed
- _____

Fall Protection

- Fall protection plan on file
- Full harness / shock absorbing lanyard used
- Anchoring points secured
- Perimeter barricades
- Open sided floor protection
- 6'-0" Tie-off utilized
- _____

Paperwork

- MSDS Information
- Contractors Safety Program
- Hazardous Communications Training
- Hazardous Communications Program
- Contractor Qualified Representation
- _____

Other

- _____
- _____

Foreman / Competent Person:

Print Name _____

SECTION 013300 – SUBMITTAL PROCEDURES

1. GENERAL PROVISIONS

1.1 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

2.1 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.

2.2 Policies or Certificates of Insurance: Two (2) copies simultaneously with the signed Agreement. See General Conditions Article 11 and Supplementary Conditions.

2.3 Contractor's License: Submit a copy of all business licenses required by local and state agencies.

2.4 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.

2.5 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.

2.6 Submittal Schedule: Two (2) copies for review and reference within 21 days after the Agreement is signed. See provisions in this Section.

2.7 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

3.1 Refer to requirements in Section 011100 - INSTRUCTIONS TO BIDDERS for filing of Surety Bonds with the Division of Revenue.

3.2 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

4.1 See Section 017700 - CONTRACT CLOSE OUT: for submittal requirements for Contract Close out.

5. SUBMITTALS

5.1 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.

5.2 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.

5.3 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

6.1 Conform to provisions in General Conditions applying to Shop Drawings.

6.2 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

7.1 Conform to provisions in General Conditions applying to Product Data.

7.2 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.

7.3 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

8.1 Conform to provisions in General Conditions applying to Samples.

8.2 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.

8.3 Field samples and mock-ups; See requirements, if any, in other specification Sections.

9. SUBMITTAL REQUIREMENTS

9.1 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 contractor.

9.2 Number of submittals required.

1. Shop drawings: Submit eight (8) copies for each submittal. Copies will be marked up with corrections and comments, stamped and returned. Any additional copies required by the Contractor shall be made by him.
2. Product Data: Submit eight (8) copies. Four (4) will be retained by the Architect, the Construction Manager and the Consultants. Four (4) will be reviewed, marked and stamped by the Architect and returned to the Contractor by the

Construction Manager. Any additional copies required by the Contractor shall be made by him from the stamped copy.

3. Samples: Submit four (4) each. Submit all transmittal data and pictures of samples through the Building Blok Management System for tracking purposes. When approved the samples will be returned to the Construction Manager to be retained at the site for reference use.

9.3 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.

- 9.4 Shop Drawing coordination and interface with work of other Contracts and adjacent work is the responsibility of each individual Contractor.

10. RESUBMISSION REQUIREMENTS

10.1 Make any corrections or changes in the submittals required by the Architect and resubmit until approved.

10.2 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.

10.3 Samples: Submit new samples as required for initial submittal.

11. FINAL DISTRIBUTION OF APPROVED SUBMITTALS

11.1 The Construction Manager will receive and log submittals and forward to Architect after processing.

11.2 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.

11.3 The Construction Manager will distribute samples as required.

11.4 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

12.1 Use AIA Document G703, Continuation Sheet to G702.

13. PROGRESS SCHEDULE

13.1 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.

13.2 Format of listings: The chronological order of the start of each item of work.

13.3 Show the complete sequence of construction by activity.

13.4 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.

13.5 Show projected percentage of completion for each item as of the first day of each month.

13.6 Update Progress Schedule monthly and submit with Application for Payment and Schedule of values.

13.7 Indicate progress of each activity to date of submission.

13.8 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.
- 13.9 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.
- 13.10 Submit one reproducible transparency.
- 13.11 After review, distribute copies of the schedule to:
1. Jobsite File.
 2. Subcontractors.
 3. Architect.
 4. Owner.
- 13.12 Instruct recipients to report promptly to the Contractor, in writing, any problems anticipated by the projections shown in the schedules.

END OF SECTION

SECTION 013500 – CONTRACTOR EMPLOYEE BACKGROUND CHECK

1. It is the contractor's responsibility to perform background checks and screen all employees working onsite. The background check must include checking for a previous history of Child Abuse Convictions, Child Molestation Convictions, Felony Convictions, and Drug Convictions within the last 5 years. Any employee with any of these convictions may not enter the job site or school campus. This background check must be completed and screened by the contractor prior to an employee entering the job site. The Construction Manager, The Owner's representative and the Owner have the right to request that the screening data be submitted on a case by case basis.

END OF SECTION

SECTION 013523 - SAFETY PROGRAM

1. GENERAL

- 1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety activities and programs in connection with the Work.
- 1.2 Contractor shall be responsible for the safety of its personnel.
- 1.3 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) and work boots.

2. SAFETY PROGRAM

- 2.1 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 MSDS information in a 2" ringed notebook. One paper copy of the safety program and MSDS will be retained by the Construction Manager in the field office.
- 2.2 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 site specific.** Contractor shall implement and enforce its safety program, which is in accordance with all OSHA, Federal, State and local laws.
- 2.3 Contractor shall designate a qualified Safety Supervisor to implement their safety program. Unless otherwise approved by the Construction Manager, the Safety Supervisor shall be the Contractor's Field Superintendent/Foremen.
- 2.4 Contractor shall furnish the names and qualifications of the 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. See the attached Competent/Qualified Person Designation Log.
- 2.5 Contractor shall provide written certification showing that all employees have been trained on the Contractor's Safety Program. 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. 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.

- 2.6 Contractor shall provide certification of training on the following programs, as they pertain to your contract and project tasks: Scaffold, Fall Protection, Crane Operator, Signal Person, Crane Maintenance, Steel Erection Fall Protection, Respiratory Protection, Powder-Actuated Tools, and Motor Vehicles. 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. This list is not meant to be all inclusive; please refer to OSHA regulations for applicable safety requirements.
- 2.7 Contractor Daily Reports with Safety Inspection Checklist will be submitted daily to Field Manager, verifying inspection of work area, machinery, equipment and tools.
- 2.8 Prior to starting work on-site, the Contractor shall arrange with the on-site Field Manager to have their employees complete the EDiS Company Zero Accidents Safety Orientation program.
- 2.9 Contractor shall hold weekly safety toolbox talks with all of its employees every Monday at 12:30 PM. The Contractor shall designate a responsible, 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

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's work sites. The Policy is as follows:

- 3.1 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.

- 3.2 It is a violation for employees and Contractors' employees to report to work while influenced by illegal drugs or alcohol.
- 3.3. 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.
- 3.4 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.

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

- 4.1 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. 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 Contractor, and may be deducted from any payments due Contractor.
- 4.2 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.

- 4.3 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.
- 4.4 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.
- 4.5 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.
- 4.6 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.
- 4.7 Contractor certifies that the forgoing terms shall be made applicable to all Contractors' suppliers, materialmen or anyone furnishing labor and/or materials to the site.
- 4.8 The Contractor shall continue to educate his 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 seeing that they are enforced.
 5. Setting a good example for his workers.

6. Making a complete investigation of accidents to determine facts necessary to take corrective action.
 7. Promptly completing a "Supervisor's Investigation Form" with his Supervisor's assistance and distributing as required. This form will be provided by the Construction Manager.
 8. Holding weekly "tool box" safety meetings with his men to:
 - a. Discuss observed unsafe work practices or conditions including a review of current Construction Manager safety report.
 - b. Review the accident experience of his crew and discuss correction of accident 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 job superintendent any observed unsafe conditions, practices or violations of job security.
 11. Making all reports required by these Contract Documents to the Construction Manager in a full and timely fashion.
5. SAFETY MEETINGS
- 5.1 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
- 6.1 The Contractor shall schedule weekly "tool box" safety sessions to be held by his job safety supervisor or superintendent for all of his employees.
 - 6.2 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

- 7.1 Contractors shall report all accidents or injuries on a timely basis in accordance with all applicable regulations.
- 7.2 Contractors shall promptly complete an accident investigation report of all accidents.
- 7.3 A record of all "tool box" safety sessions shall be made and submitted to the Construction Manager on forms to be provided.

8. SAFETY REPRESENTATIVE

- 8.1 The Construction Manager may employ the services of a Safety Representative on the project.
- 8.2 The Safety Representative *will* visit the job site on a weekly basis to determine if the work is being performed in a safe manner and in accordance with OSHA, State and Local safety regulations. Safety representative is not responsible for observing and documenting all possible safety violations. The Contractor's Safety Representative or Superintendent shall attend job site safety inspections with the Safety Representative on a weekly basis.
- 8.3 The Safety Representative will file a written report with the Construction Manager at the end of each inspection listing the safety violations observed during the inspection.
- 8.4 The Construction Manager will distribute the Safety Representative's report to all Contractors. All safety violations must be corrected immediately.

9. RIGHT TO STOP THE WORK DUE TO SAFETY VIOLATIONS

- 9.1 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.
- 9.2 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.

- 9.3 If the Construction Manager or Safety Representative observes Contractor's employee violating this safety program or OSHA Standards in an 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

- 10.1 The Construction Manager shall establish a central meeting location for the assembly of all Contractors' employees in the event of a major job site emergency.
- 10.2 Contractor shall assemble all of their personnel and account for all employees. Contractor must immediately report to the Project Superintendent with the status of their employees.

11. FALL PROTECTION PROCEDURES

- 11.1 Contractor is 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.

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.

1. Workers constructing or working near leading edges must be protected.
2. Workers on the face of formwork or reinforcing steel must be protected at a height of 6 feet (6') or greater.
3. Scaffolds shall be guarded at 6 feet (6') above next lower level.
4. Brick layers performing overhand bricklaying and related work six feet (6') or higher above lower levels must be protected from falls.
5. Roofers must comply with OSHA standards for roof work.
6. 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.

7. Guidelines for Residential Construction or any interpretations will not be accepted in lieu of 1926 Standards.
8. Contractors must provide certification per OSHA CFR29 § 1926.503(b) of employee training and retraining on fall protection upon request.
- 11.2 Contractor shall provide its 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 standards.
- 11.3 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.
- 11.4 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.
- 11.5 Fall protection will be enforced for Structural Steel Erectors.
 1. As for a Contractor engaged in structural steel erection, the Contractor is 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. Maximum free fall distance permitted, with lanyard and lanyard attachment shall not exceed six feet (6'). Anchor point must be capable of supporting five thousand pounds. Perimeter guard cables or alignment cables may not be used for anchor points.
 - c. Access to work area shall be provided by ladders. There shall be sufficient number of ladders 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 his employees has 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.

END OF SECTION

CONTRACTOR

COMPETENT / QUALIFIED PERSON DESIGNATION LOG

Project: Wilmington Campus Renovations

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			

Contract: Contractor:	Applicable to Subcontractor (yes / no)	Foreman	Competent Person (if not foreman)
1926.852 Chutes			
1926.859 Mechanical Demolition			
Subpart V - Power Transmission and Distribution			
1926.955 Overhead Lines			
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

Certification of Training Documents to be Submitted with Safety Policy/Program

Provide a certification of training for employees on your safety program.

In addition, Contractor shall provide certification of training on the following programs, as they pertain to your contract and project tasks. 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. 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

SECTION 014500 - QUALITY CONTROL

1. DESCRIPTION

1.1 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

2.1 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.

2.2 Retest Responsibility: Where results of inspections or test do not indicate compliance with Contract Documents, retests are the Contractor's responsibility.

2.3 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.

2.4 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.

2.5 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.

- 2.6 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.
- 2.7 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.
- 2.8 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."

END OF SECTION

SECTION 015113 - TEMPORARY ELECTRICITY

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

1. Electrical Basic Materials and Methods, Division 16 or 26.

1.2 DESCRIPTION OF SYSTEM

1. Power Source

1. Suppliers: Delmarva Power
2. The Construction Manager shall provide 277/480 volt, three phase, 60 cycle power service to the site from the existing service.
3. The Construction Manager 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 1.2.1.2, above.
4. The source will be adequate to service temporary electrical needs of the proposed construction.

2. Electrical Service

1. 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.
2. 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 1.2.2.3, 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 1.2.2.3, below.
3. The Construction Manager or Electrical Contractor, as provided in 1.2.2.2 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.
 2. Adequate lighting for safe working conditions shall be provided and maintained on a 24 hour per day basis throughout the building, tunnels, and stairways per OSHA requirements. Each lamp must be rated at least 100 watts. Voltage of each socket must be at least 110 volts.
 3. Power for testing and checking equipment must be supplied.
3. Capacity
1. 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.
 2. The Electrical Contractor shall notify the Power Company if unusually heavy loads, such as welding units, are anticipated.
4. Power Costs
1. The Construction Manager will pay all costs of temporary electrical power used during construction.
 2. The Owner will pay all costs of power used in the permanent wiring.

1.3 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.

1.4 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

2.1 MATERIALS

1. General

1. 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

1. Use wire, cable, or busses of appropriate type, sized in accordance with the National Electrical Code for the applied loads.

2. Use only UL labeled wire and devices.

2.2 EQUIPMENT

1. Provide appropriate enclosure for the environment in which used in compliance with NEMA standards.

3. EXECUTION

3.1 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.

3.2 INSTALLATION

1. Locate so that interference with storage areas, traffic areas and work under other Contracts is avoided.

3.3 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

1.1 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.

1.2 DEFINITIONS

1. Temporary Enclosures: Sufficient preliminary enclosures of an area of structure, or of an entire building, to prevent entrance or infiltration of rain water, 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.

1.3 DESCRIPTION OF SYSTEM

1. Prior to the building or portion of building being permanently enclosed, the contractor shall provide temporary heat and ventilation and weather protection necessary for his work, as described below. After permanent enclosure, the Construction Manager will provide temporary heat and ventilation in enclosed areas required to:
 1. Facilitate progress of Work.
 2. Protect Work and products against dampness and cold.
 3. Prevent moisture condensation on surfaces.
 4. Provide suitable ambient temperatures and humidity levels for installation and curing of materials.
 5. Provide adequate ventilation to meet health regulations for safe working environment.

2. Temperatures Required

1. Generally, 24 hours a day: Minimum of 40 degrees F.
2. 24 hours a day during placing, setting and curing of cementitious materials: As required by specification section for each product.
3. 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.
4. 24 hours a day after application of finishes, and until Substantial Completion: Minimum of 50 degrees F.

3. Ventilation Required:

1. Contractors shall prevent hazardous accumulations of dusts, fumes, mists, vapors or gases in areas occupied during construction.
 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.

2. Contractors shall provide adequate ventilation for:

1. Curing installed materials.
2. Dispersal of humidity.
3. Temporary sanitary facilities.

3. Duration of Operations:

1. 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.

2. For curing installed materials: As required by specification section for respective materials.
3. For humidity dispersal: Continuously ventilate to provide suitable ambient conditions for work.
4. The Construction Manager shall maintain strict supervision of 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.

1.4 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 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 1.3, above.

1.5 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

2.1 MATERIALS

1. General

1. 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.

2.2 EQUIPMENT

1. Standard products, meeting code requirements.
2. Provide required facilities, including piping, wiring and controls.
3. Portable Heater: Standard Units, meeting code requirements.
 1. Safety Controls against explosion, overheating, and carbon monoxide build up.
 2. Vent direct-fired units to outside.
 3. Provide adequate combustion air.
4. Oil-Fired heaters will not be allowed.

3. EXECUTION

3.1 GENERAL

1. Comply with applicable sections of Division 15 - 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.

3.2 INSTALLATION

1. Locate units to provide equitable distribution of heat and air movements.
2. Locate to avoid interference with, or hazards to:
 1. Work or movement of personnel.

2. Traffic areas.
3. Materials handling.
4. Storage areas.
5. Work of other Contractors.
6. Finishes.

3.3 OPERATION OF PERMANENT EQUIPMENT

1. The Construction Manager will coordinate with Contractor.
2. The 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:
 1. Inspection has been made by proper authorities.
 2. Systems, equipment piping, strainers, filters and associated operating items are sufficiently complete, cleaned, and ready for operation.
 3. Controls and safety devices are complete and tested, or adequate temporary controls are provided.
 4. Before operating the permanent HVAC equipment, the Contractor shall install temporary filters:
 1. For air handling units.
 2. For permanent ducts.

3.4 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

1.1 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.

1.2 RELATED WORK SPECIFIED ELSEWHERE

1. Temporary Electric: Section 015113.

2. FACILITIES

2.1 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 of 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.

2.2 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.

2.3 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.

2.4 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.

2.5 FIRE PROTECTION

1. The Carpentry & General Work Contractor will provide and maintain temporary 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.

2.6 ACCESS ROADS AND PARKING AREAS

1. 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.

2.7 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. Contractor 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, whichever is the most stringent.

2.8 FIRST AID STATION

1. The Construction Manager will provide and maintain an unmanned first aid station for all personnel in his jobsite office.

2.9 SECURITY

1. The Construction Manager will provide the following security measures at the site: security lighting will be provided.
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.

2.10 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. Each 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.

2.11 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.

2.12 PROJECT SIGN

1. The Construction Manager will provide a Project Sign naming the major participants, as determined by the Owner.

2.13 TRASH DISPOSAL

1. Each Contractor shall be responsible for 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.

2.14 HOISTING

1. Contractor shall provide its own materials hoists and cranes. No personnel hoist will be provided.

2.15 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.

2.16 SAFETY BARRICADES AND RAILINGS

1. The Structural Contractor shall provide barricades around elevator, stair, shaft and cut openings in floors and roofs, and edges of floors and roofs. All barricades shall at a minimum, be constructed of two runs of 1/2" diameter wire rope cable with adequate turn-buckle and eyes such that no more than 60' of cable need be loosened or removed at any given location for access. All cables shall be installed such that no more than 3" of deflection of the cable is achieved at any point between supports. The methods and materials used in barricading shall be in accordance with OSHA and local code regulations, and shall be approved by the Construction Manager prior to installation. Barricades 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. After a level has been fully barricaded, the Construction Manager will assume maintenance of

the barricades until a subsequent contractor requires the barricades to be removed in order to accomplish his work, at which time that contractor will assume maintenance of the barricades.

2. After the barricades are no longer needed, the Construction Manager will remove the barricades from the site. The Construction Manager will determine the location and scheduling of barriers to be removed.
3. Each 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, whichever 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.

2.17 PUMPING AND DRAINAGE

1. Each 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.

2.18 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.

2.19 TEMPORARY POWER AND LIGHTING

1. Each 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. Each Contractor shall provide its own additional temporary lighting of sufficient lighting levels to properly install his work.

2.20 TEMPORARY HEAT

1. Each 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 satisfactory to the Construction Manager.

2.21 PROTECTION OF ADJACENT MATERIALS

1. Each Contractor shall protect adjacent materials and finishes from damage as a result of its work.

2.22 CLEAN UP

1. Each 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 scheduled on a continual basis to ensure that building, grounds and public properties are maintained free from accumulations of waste materials and trash, but in any case not less than once a week.
2. The Contractor will ensure that all waste materials that are combustible or flammable will be removed from the building at the end of each work day. All trash considered to be edible by rodent 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.

2.23 DUST PROTECTION

1. Each 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 such dust protection.

2.24 PROTECTION OF EXISTING CONSTRUCTION

1. Each Contractor shall be responsible for all damage that it may cause to materials and equipment stored or installed by other Contractors.

2.25 OTHER

1. Each 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

4.1 GENERAL

1. Each Contractor shall install all temporary facilities in accordance with applicable codes.
2. Each Contractor shall maintain temporary facilities for which it is responsible throughout the construction period.

3. Each 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. Each 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

- 1.1 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.
- 1.2 Where work is to be executed under Separate Prime Contracts, the provisions of this Section apply to each Contract.

2. REQUIREMENTS INCLUDED

2.1 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.

2.2 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.

2.3 Contractor shall not use materials or equipment for any purpose other than that for which it is designated or is specified.

2.4 Materials removed from existing structures shall not be reused in the completed work unless specifically indicated or specified.

2.5 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

3.1 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.

3.2 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

4.1 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.

4.2 Contractor shall provide equipment and personnel to handle Products by methods to prevent soiling or damage to Products or packaging.

5. STORAGE AND PROTECTION

5.1 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 manufacture's instructions.

5.2 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.

5.3 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.

5.4 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.

5.5 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

6.1 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.

6.2 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 1.6.3.
4. For Products specified by naming only one Product and manufacturer, there is no option; and Contractor shall provide the precise Product specified.

6.3 Substitutions.

1. 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.**
2. 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:
 1. Comparison of the qualities of the proposed substitution with that specified.
 2. Changes required in other elements of the Work because of the substitution.
 3. Effect on the construction schedule.

4. Cost data comparing the proposed substitution with the Product specified.
 5. Any required license fees or royalties.
 6. Availability of maintenance service, and source of replacement materials.
3. Architect, in its sole discretion, shall be the judge of the acceptability of the proposed substitution.
 4. A request for a substitution constitutes a representation that Bidder:
 1. has investigated the proposed Product and determined that it is equal to or superior in all respects to that specified;
 2. will provide the same warranties or bonds for the substitution as for the Product specified;
 3. 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
 4. waives all claims for additional costs, under his responsibility, which may subsequently become apparent.
- 6.4 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.

END OF SECTION

SECTION 017329 - CUTTING AND PATCHING

1. GENERAL

- 1.1 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.
- 1.2 Refer to Other Sections of these specifications for specific cutting and patching requirements and limitations applicable to individual units of work.
- 1.3 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.
- 1.4 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.
- 1.5 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
- 1.6 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

- 2.1 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

3.1 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.

3.2 Temporary Support: To prevent failure provide temporary support of work to be cut.

3.3 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.

3.4 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.

3.5 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

1.1 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

2.1 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.

2.2 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.

2.3 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

3.1 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. CLOSEOUT DOCUMENTATION

4.1 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.

4.2 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.

4.3 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.

4.4 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

4.5 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

5.1 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

6.1 At the time of project close out Contractor shall clean or reclean 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 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 1000, 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.
- B. Concrete formwork.
- C. Concrete reinforcement.
- D. Joint devices associated with concrete work.
- E. Miscellaneous concrete elements, including concrete slab patching.
- F. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. 03 30 50 - Integral Concrete Waterproofing.
- B. Section 03 35 11 - Concrete Floor Finishes: Densifiers, hardeners, applied coatings, and polishing.

1.03 REFERENCE STANDARDS

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; American Concrete Institute International; 2010.
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).
- C. ACI 301 - Specifications for Structural Concrete; American Concrete Institute International; 2010.
- D. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004 (Errata 2007).
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.
- F. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 2010.
- G. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 2010.
- H. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2001 (Reapproved 2008).
- I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2011.
- J. ACI 347 - Guide to Formwork for Concrete; American Concrete Institute International; 2004.
- K. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.
- L. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Billet-Steel Bars for Concrete Reinforcement; 2012.
- M. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2011a.
- N. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2012.
- O. ASTM C150/C150M - Standard Specification for Portland Cement; 2012.
- P. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2007.

- Q. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 1999 (Reapproved 2008).
- R. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2011.
- S. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- C. Samples: Submit samples of underslab vapor retarder to be used.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Formwork Design and Construction: Comply with guidelines of ACI 347 to provide formwork that will produce concrete complying with tolerances of ACI 117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.

2.02 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M Grade 60 (420).
- B. Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain type.
 - 1. Form: Flat Sheets.
 - 2. Mesh Size: 6 x 6.
 - 3. Wire Gage: W 4 x W 4.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type I - Normal Portland type.
- B. Fine and Coarse Aggregates: ASTM C 33.
- C. Lightweight Aggregate: ASTM C 330.
- D. Water: Clean and not detrimental to concrete.

2.04 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder: Multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
 - 1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.
 - 2. Products:
 - a. Insulation Solutions, Inc; Viper VaporCheck II 15-mil (Class A):
www.insulationsolutions.com.

- b. Stego Industries, LLC; Stego Wrap Vapor Barrier 15-mil (Class A):
www.stegoindustries.com.
 - c. W.R. Meadows, Inc.; PERMINATOR Class A - 15 mils: www.wrmeadows.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
- Moisture-Retaining Cover: ASTM C 171; regular curing paper, white curing paper, clear polyethylene, white polyethylene, or white burlap-polyethylene sheet.

2.05 BONDING AND JOINTING PRODUCTS

- A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059 Type II.
- B. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

2.06 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
 - 1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.
- B. Proportioning Structural Lightweight Concrete: Comply with ACI 211.2 recommendations.
 - 1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.
- C. Concrete Strength: Establish required average strength for each type of concrete on the basis of trial mixtures, as specified in ACI 301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- D. Normal Weight Concrete:
 - Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3,000 psi.

2.07 MIXING

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.
- B. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
 - 1. Use latex bonding agent only for non-load-bearing applications.
- C. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.03 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.04 SLAB JOINTING

- A. Locate joints as indicated on the drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

3.05 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Maximum Variation of Surface Flatness:
 - 1. Exposed Concrete Floors: 1/4 inch in 10 ft.
 - 2. Under Seamless Resilient Flooring: 1/4 inch in 10 ft.
 - 3. Under Carpeting: 1/4 inch in 10 ft.
- B. Correct the slab surface if tolerances are less than specified.
- C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.06 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Surfaces Not in Contact with Forms:
 - 1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
 - 2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-fog spray, or saturated burlap.
 - 3. Final Curing: Begin after initial curing but before surface is dry.
 - Moisture-Retaining Cover: Seal in place with waterproof tape or adhesive.

END OF SECTION

SECTION 03 30 50
INTEGRAL CONCRETE WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 1000, 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
- B. Crystalline waterproofing admixture for concrete.
- C. Crystalline waterproofing treatment and waterstops of construction joints between successive concrete pours.
- D. The work of this section applies to concrete in the following locations:
 - 1. Auditorium floor slab below grade.

1.02 RELATED SECTIONS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete materials and placement.
- B. Section 07 13 00 - Sheet Waterproofing

1.03 REFERENCES

- A. ACI 305R - Hot Weather Concreting.
- B. ACI 306R - Cold Weather Concreting.
- C. ACI 308 - Standard Practice for Curing Concrete.
- D. ASTM C 39/C 39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- E. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- F. ASTM C 666 - Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
- G. ASTM E 329 - Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
- H. COE CRD-C 48 - Standard Test Method for Water Permeability of Concrete.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Submit manufacturer's certification that proposed materials, details and systems as indicated and specified fully comply with manufacturer's details and specifications. If any portion of Contract Documents do not conform to manufacturer's standard recommendations, submit notification of portions of design that are at variance with manufacturer's specifications
- C. 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 methods.
 - 4. MSDS for product.
- D. Manufacturer's Certificates:
 - 1. Certify products meet or exceed specified requirements.
 - 2. Certify that proposed material is compatible with concrete mix design

- E. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic checking and adjustment of cable tension and periodic cleaning and maintenance of all railing and infill components.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm with not less than 10 years experience manufacturing crystalline waterproofing of the type specified, able to provide test reports showing compliance with specified performance characteristics, and able to provide on-site technical representation to advise on installation.
- B. Installer Qualifications: Experienced in work of the type specified in this section and acceptable to waterproofing manufacturer.
- C. Preinstallation Meeting: Before installation, conduct a meeting with the Contractor, waterproofing installer, installers of adjacent work and work penetrating waterproofing, and the waterproofing manufacturer's representative to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer' warranty requirements; notify the Owner and Architect/Engineer at least one week in advance of meeting.
 - 1. Trial mixes shall be carried out with proposed mix design to insure that mix meets all requirements set forth in the specification, prior to actual installation of concrete.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1.07 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 absolute limits.

1.08 WARRANTY

- A. Manufacturer's Warranty: Provide manufacturer's standard warranty document executed by authorized company official; warranty period: 25 years commencing on Date of Substantial Completion.

1.09 EXTRA MATERIALS

- A. See Section 01 60 00- Product Requirements, for additional provisions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer:
 - 1. Xypex Chemical Corp., 13731 Mayfield Pl. Richmond, BC, Canada V6V 2G9; 800-961-4477; Tel: 604-273-5265; Web: www.xypex.com.
 - 2. AQUAFIN, Inc. 505 Blue Ball Rd., #160, Elkton, MD, 21921 (800) 394-1410 or (410) 392-2300, Fax (410) 392-2324; Web: www.aquafin.net.
 - 3. Kryton International Inc. 1645 East Kent Avenue, Vancouver BC V5P 2S8; 800-267-8280; Tel: 604-324-8280; Fax: 604-324-8899; Web: www.kryton.com.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.02 MATERIALS

- A. Product: Xypex Admix C-500, C-1000 or C-2000 manufactured by Xypex Chemical Corp
- B. Product: Aquafin®-IC ADMIX manufactured by AQUAFIN, Inc.
- C. Product: KIM manufactured by Kryton International Inc
- D. SEM Analysis: Provide evidence of crystalline formation evidenced by scanning electron microscope photographs.
- E. Permeability: No measurable leakage through waterproofed concrete, when tested in accordance with COE CRD-C 48 at 350 feet (106 m) of head or 150 psi (1034 kPa).
- F. Chemical Resistance: Minimum 20% less weight loss compared to untreated specimen after exposure to 5% sulfuric acid for 70 days, when tested as follows:
- G. Test specimens consisting of concrete made with admixture dosage rates (to weight of cement) of 3 percent, 5 percent, and 7 percent, and a control sample prepared without admixture.
- H. Compressive Strength: At least 10 percent increase in strength compared to samples prepared without admixture, when tested in accordance with ASTM C 39/C 39M after 28 days.

2.03 ACCESSORIES

- A. Waterstops, cold-joint primer, grout and sealants:
 - 1. Provide compatible materials manufactured by the integral concrete waterproofing manufacturer.

PART 3 EXECUTION

3.01 CONCRETE MIXING AND PLACING

- A. Comply with requirements of Section 03 30 00.
- B. Make and test trial mixes under project conditions to determine setting time and strength of concrete; obtain manufacturer's recommendations regarding mix design, project conditions, and dosage rate.
- C. Add waterproofing admixture at time of batching and blend thoroughly, following manufacturer's instructions.
- D. In hot weather comply with ACI 305R; in cold weather comply with ACI 306R; use monomolecular film (evaporation retardant) on slabs during hot, dry, or windy conditions.
- E. Moist cure concrete in accordance with ACI 308; if moist curing is not possible, use curing compound complying with ASTM C 309.

3.02 CONSTRUCTION JOINTS

- A. Comply with manufacturer's instructions, including technical bulletins, catalog installation instructions, and product packaging labels.
- B. Verify substrate conditions installed as specified in Section 03 30 00 - Cast-in-Place Concrete are acceptable for product installation in accordance with manufacturer' instructions; do not install unless substrate and ambient air temperature are within range acceptable to waterproofing manufacturer.
- C. Prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions.
- D. Clean laitance, dirt film, paint, coatings or other foreign matter harmful to the performance of waterproofing from surfaces of cured concrete to be treated.
- E. Mix materials in accordance with manufacturer's instructions.
- F. Follow manufacturer's instructions for cold joint and waterstop iinstallation.

3.03 FIELD QUALITY CONTROL

- A. Do not cover admixture treated concrete with other construction until it has been observed by manufacturer's field representative and Architect/Engineer.
- B. After removal of forms, patch and repair honeycombing, rock pockets, tie holes, faulty construction joints, cold joints, and cracks using waterproofing admixture manufacturer's recommended procedures.
- C. Manufacturer's Field Services: Provide manufacturer's field service consisting of product use recommendations and periodic site visits for inspection of concrete batching and product installation in accordance with manufacturer's instructions.
- D. Flood test areas that are capable of holding water after end of curing period.
 - 1. Plug or dam drains.
 - 2. Test slabs by constructing temporary dams where necessary, at least 2 inches (50 mm) high, and filling with 2 inches (50 mm) of water.
 - 3. Let water stand for 24 hours.
 - 4. Repair leaks and retest until no leaks are observed.

3.04 CLEANING AND PROTECTION

- A. Protect installed concrete from damage during construction.
- B. When backfilling occurs less than 7 days after installation, use moist backfill material.
- C. Do not apply paint or other coatings for at least 21 days; before applying coatings neutralize waterproofed surface as recommended by waterproofing manufacturer.

END OF SECTION

SECTION 03 35 11
CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface treatments for concrete floors and slabs.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with concrete floor placement and concrete floor curing.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.
- C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.05 MOCK-UP

- A. For coatings, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.
- B. Mock-Up Size: 10 feet square.
- C. Locate where directed.
- D. Mock-up may remain as part of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.07 FIELD CONDITIONS

- A. Maintain light level equivalent to a minimum 200 W light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.
- B. Do not finish floors until interior heating system is operational.
- C. Maintain ambient temperature of 50 degrees F minimum.

PART 2 PRODUCTS

2.01 CONCRETE FLOOR FINISH APPLICATIONS

- A. High Gloss Clear Sealer:
- B. Polished Finish:

2.02 COATINGS

- A. Refer to Section 09 90 01 Paints and Coatings for concrete sealer.
- B. High Gloss Clear Sealer: Transparent, non-yellowing, water-based coating.
 - 1. Composition: Acrylic polymer-based.
 - 2. Nonvolatile Content: 40 percent, minimum, when measured by volume.
 - 3. Products:
 - a. BRICKFORM; BRICKFORM Gem-Seal 100 VOC : www.brickform.com.
 - b. W.R. Meadows, Inc; Deck-O-Grip W/B (slip-resistant): www.wrmeadows.com.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 POLISHED CONCRETE SYSTEM

- A. Polished Concrete System: Materials, equipment, and procedures designed and furnished by a single manufacturer to produce dense polished concrete of the specified sheen.
 - 1. Acceptable Systems:
 - a. ARDEX Engineered Cements; ULTRAFLOOR Polished Concrete System with ARDEX PC Finish sealer: www.ardexamericas.com.
 - b. L&M Construction Chemicals, Inc.; FGS Permashine Concrete Polishing System: www.lmcc.com.
 - c. W.R. Meadows, Inc; Induroshine with Bellatrix sealer: www.wrmeadows.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that floor surfaces are acceptable to receive the work of this section.
- B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 GENERAL

- A. Apply materials in accordance with manufacturer's instructions.

3.03 COATING APPLICATION

- A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.
- B. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

3.04 CONCRETE POLISHING

- A. Execute using materials, equipment, and procedures specified by manufacturer, using manufacturer approved installer.
 - 1. Final Polished Sheen: Semigloss finish; other sheens are included as comparison to illustrate required sheen; final sheen is before addition of any sealer or coating, regardless of whether that is also specified or not.
 - 2. Semi-Gloss Finish: Reflecting overhead and side images from 35 to 45 feet away.
- B. Protect finished surface as required and recommended by manufacturer of polishing system.

END OF SECTION

SECTION 04 20 00

UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Concrete Block.
- C. Ceramic Glazed Structural Clay Facing Tile.
- D. Mortar and Grout.
- E. Reinforcement and Anchorage.
- F. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 90 05 - Joint Sealers: Backing rod and sealant at control and expansion joints.

1.03 REFERENCE STANDARDS

- A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; American Concrete Institute International; 2011.
- B. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.
- C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a.
- D. ASTM C126 - Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units; 2012.
- E. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.
- F. ASTM C150/C150M - Standard Specification for Portland Cement; 2012.
- G. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
- H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2012.
- I. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.
- J. ASTM C476 - Standard Specification for Grout for Masonry; 2010.
- K. ASTM C652 - Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale); 2012.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Shop Drawings: For the following:
 - 1. Pre-Faced CMU's: Show sizes, colors, coursing, and locations of special colors.
 - 2. Embedded Masonry Flashing: showing location of each course in wall section and plan view of each course with all details and stop ends referenced.

1.05 QUALITY ASSURANCE

- A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.

1.06 MOCK-UP

- A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high; include mortar and accessories and structural backup in mock-up.
- B. Locate where directed.

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.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Regional Materials: Provide CMUs that have been manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
 - 2. Size: Standard units with nominal face dimensions of 16 x 8 inches and nominal depths as indicated on the drawings for specific locations.
 - 3. Special Shapes: Provide non-standard blocks configured for corners.
 - a. Provide bullnose blocks at exposed corners.
 - b. Provide square edge blocks for corners scheduled to receive tile or other finishes.
 - 4. Load-Bearing Units: ASTM C90, normal weight.

2.02 DECORATIVE CONCRETE MASONRY UNITS

- A. Regional Materials: Provide CMUs that have been manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide bullnose units for exposed outside corners, including door jambs and other openings in masonry partitions, unless otherwise indicated.
- C. Ground-Face CMUs: ASTM C 90.
 - 1. Basis of Design Product: Subject to compliance with requirements, provide Fizzano Brothers; ground face block or comparable product by one of the following:
 - a. Betco Supreme
 - 2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
 - 3. Size (Width): Manufactured to the following dimensions:
 - a. 6 inches nominal; 5-5/8 inches actual.
 - 4. Pattern and Texture:
 - a. Pattern, ground-face finish on opposite faces.
 - 5. Color: To be selected

2.03 BRICK UNITS

- A. Facing Brick: ASTM C216, Type FBS, Grade SW.
 - 1. Color and texture: Match existing with new or salvaged bricks.

2. Actual size: Match existing.
3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."

2.04 CLAY TILE UNITS

- A. Manufacturers:
 1. Elgin Butler Company: www.elginbutler.com.
 2. Substitutions: See section 01 60 00 - Product requirements.
- B. Ceramic Glazed Structural Clay Facing Tile: ASTM C126; Grade S (Select); Type I (single-faced units).
 1. Color and texture: Custom mottled finish to match existing.
 2. Size: 6T Series, thickness as indicated.
 3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn without chipping to produce equivalent effect.

2.05 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C91, Not Permitted.
- B. Portland Cement: ASTM C150, Type I; color as required to produce approved color sample.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Mortar Aggregate: ASTM C144.
- E. Grout Aggregate: ASTM C404.
- F. Water: Clean and potable.

2.06 REINFORCEMENT AND ANCHORAGE

- A. Single Wythe Joint Reinforcement: Truss type; ASTM A 82/A 82M steel wire, mill galvanized to ASTM A 641/A 641M, Class 3; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

2.07 FLASHINGS

- A. Shelf Angles & Lintels: Flashing must be carried through the wall to prevent water from bypassing flashing.
- B. Shelf Angle Soft Joints: Flashing Membrane or Drip must be compatible with wet sealant. Provide letter from flashing manufacturer addressing sealant compatibility.
- C. Lap Sealant: Butyl type as specified in Section 07 90 05.

2.08 ACCESSORIES

- A. Preformed Control Joints: Neoprene material. Provide with corner and tee accessories, fused joints.
- B. Joint Filler: Closed cell neoprene; oversized 50 percent to joint width; self expanding; 3.5 inch wide x by maximum lengths available.
 1. Manufacturers:
 - a. Williams Products, Inc.; Product Type NN1, 1040 Series.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.
- C. 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: Panels designed for installation at flashing locations.
 - a. Manufacturers:

- 1) Advanced Building Products Inc: www.advancedflashing.com.
- 2) Mortar Net USA, Ltd: www.mortarnet.com.

D. Weeps: Open Head Joints.

E. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.09 MORTAR AND GROUT MIXES

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.

B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

C. Grout: ASTM C476. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

PART 3 EXECUTION

3.01 COURSING

A. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

B. Concrete Masonry Units:

1. Bond: Running.

2. Coursing: One unit and one mortar joint to equal 8 inches.

3. Mortar Joints: Concave, except at masonry to receive spray foam provide flush joints fully filled with mortar and mortar droppings removed from ties.

C. Brick Units:

1. Bond: Running.

D. Clay Tile Units:

3.02 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls.

3.03 CONTROL AND EXPANSION JOINTS

A. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.04 CUTTING AND FITTING

A. Cut and fit for chases, pipes, and conduit. 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.

3.05 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.

3.06 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 1000, 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.
- B. Structural steel framing members, support members.
- C. Grouting under base plates.

1.02 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual; American Institute of Steel Construction, Inc.; 2011.
- B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.; 2005.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- E. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2007.
- F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- G. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2012.
- H. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2010.
- I. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2009.
- J. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2007.
- K. ASTM A514/A514M - Standard Specification for High-Yield Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding; 2005 (Reapproved 2009).
- L. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011.
- M. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2011.
- N. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners; 2009.
- O. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
 - 2. Connections.

- C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.04 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC "Steel Construction Manual."
- B. Comply with Section 10 of AISC "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Steel Angles and Plates: ASTM A36/A36M.
- B. Rolled Steel Structural Shapes: ASTM A992/A992M.
- C. Hot-Formed Structural Tubing: ASTM A501, seamless or welded.
- D. Steel Bars: ASTM A108 .
- E. Steel Plate: ASTM A514/A514M.
- F. Pipe: ASTM A53/A53M, Grade B, Finish black.
- G. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A galvanized to ASTM A 153/A 153M, Class C.
- H. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, medium carbon, galvanized.
- I. Load Indicator Washers: Provide washers complying with ASTM F959 at all connections requiring high-strength bolts.
- J. Welding Materials: AWS D1.1; type required for materials being welded.
- K. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C1107/C1107M and capable of developing a minimum compressive strength of 7,000 psi at 28 days.
- L. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.
- M. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

PART 3 EXECUTION

3.01 ERECTION

- A. Erect structural steel in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges".
- B. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.02 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 31 00
STEEL DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 1000, 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.
- B. Roof deck.
- C. Composite floor deck.
- D. Bearing plates and angles.
- E. Stud shear connectors.

1.02 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.
- B. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished; 2007.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.
- D. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.
- E. AWS D1.3 - Structural Welding Code - Sheet Steel; American Welding Society; 2008.
- F. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc.; 2011.
- G. SDI (DM) - Publication No.31, Design Manual for Composite Decks, Form Decks, Roof Decks; Steel Deck Institute; 2007.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.
- B. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.
- C. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.
- D. Certificates: Certify that products furnished meet or exceed specified requirements.
- E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.
- F. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.04 QUALITY ASSURANCE

- A. Design deck layout, spans, fastening, and joints 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 the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel (AC172).

PART 2 PRODUCTS

2.01 STEEL DECK

- A. All Deck Types: Select and design metal deck in accordance with SDI Design Manual.

- B. Roof Deck: Non-composite type, fluted steel sheet:
 - 1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
- C. Composite Floor Deck: Fluted steel sheet embossed to interlock with concrete:
 - 1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.

2.02 ACCESSORY MATERIALS

- A. Bearing Plates and Angles: ASTM A36/A36M steel, unfinished.
- B. Stud Shear Connectors: Made from ASTM A108 Grade 1015 bars.
- C. Welding Materials: AWS D1.1.
- D. Fasteners: Galvanized hardened steel, self tapping.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.
- B. On concrete and masonry surfaces provide minimum 4 inch bearing.
- C. On steel supports provide minimum 1-1/2 inch bearing.
- D. Weld deck in accordance with AWS D1.3.
- E. Weld stud shear connectors through steel deck to structural members below.
- F. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

END OF SECTION

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Formed steel stud exterior wall and interior wall framing.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

- A. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.
- D. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; 2011c.
- E. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.
- F. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations .
- C. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
- D. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention .

1.05 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 FRAMING SYSTEM

- A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

2.02 FRAMING MATERIALS

- A. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.
 - 1. Gage and depth: As indicated on the drawings.
 - 2. Galvanized in accordance with ASTM A653/A653M G90/Z275 coating.
- B. Framing Connectors: Factory-made, formed steel sheet.

1. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI North American Specification for the Design of Cold Formed Steel Structural Members.
2. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.
 - a. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
3. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

2.03 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.
- B. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.04 FASTENERS

- A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.
- B. Anchorage Devices: Powder actuated.
- C. Welding: In conformance with AWS D1.1.

PART 3 EXECUTION

3.01 INSTALLATION OF STUDS

- A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.
- B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center. Coordinate installation of sealant with floor and ceiling tracks.
- C. Place studs at 16 inches on center; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fastener method.
- D. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.
- E. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.
- F. Install intermediate studs above and below openings to align with wall stud spacing.
- G. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.
- H. Attach cross studs to studs for attachment of fixtures anchored to walls.
- I. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
- J. Touch-up field welds and damaged galvanized surfaces with primer.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel and aluminum items.
- B. Prefabricated fixed and roof ladders.
- C. Prefabricated steps and landing.
- D. Catwalks with railings.
- E. Loading bridge.
- F. Roof screen with dunnage.
- G. Tiered seating supporting steel.

1.02 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 2012.
- B. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.
- F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- G. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2012.
- H. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2010.
- I. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2009.
- J. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a.
- K. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.
- L. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.
- M. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2012.
- N. ASTM B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes (Metric); 2012.
- O. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2012e1.
- P. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric); 2012e1.

- Q. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.
- R. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2012.
- S. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.
- T. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.
- U. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; American Welding Society; 2008.
- V. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc.; 2011.
- W. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).
- X. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

1.03 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. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.04 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel (AC172).

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500, Grade B cold-formed structural tubing.
- C. Plates: ASTM A283.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, galvanized to ASTM A153/A153M where connecting galvanized components.
- F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- 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 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Sheet Aluminum: ASTM B209 (ASTM B209M), 5052 alloy, H32 or H22 temper.

- C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210 (ASTM B210M), 6063 alloy, T6 temper.
- D. Aluminum-Alloy Bars: ASTM B211 (ASTM B211M), 6061 alloy, T6 temper.
- E. Bolts, Nuts, and Washers: Stainless steel.
- F. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.03 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. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED ITEMS

- A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
 - 1. Side Rails: 3/8 x 2 inches members spaced at 20 inches.
 - 2. Rungs: 1/2 inch diameter solid square bar spaced 12 inches on center.
 - 3. Space rungs 7 inches from wall surface.
 - 4. Provide brackets at top and bottom, welded to rails and bolted to building structure.
- B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of catwalk; prime paint finish.
- C. Fabricated steel sections for support of tiered seating, as shown and detailed.
- D. Fabricated steel for loading bridge, as shown and detailed.

2.05 PREFABRICATED LADDERS

2.06 MANUFACTURED PRODUCTS

- A. Aluminum stair and landing:
 - 1. Standard treads with open risers, stringers and handrail and guardrail.
 - 2. Standard landing with guard rails.
 - 3. Non-slip finish on walking surfaces.
 - 4. Provide support posts, base plates, rise and run to suit field condition.
 - 5. Product: AMST "CODE" line as manufactured by Architectural Metals of Southwest Florida.
- B. Access panel: Provide Milcor or equal prime coated steel access panel with screw cam operated locks.
 - 1. Size 2'-0" x 2'-6"
- C. Concealed Steel Countertop Brackets:
 - 1. Brackets manufactured by A & M Hardware, Inc. 2705 Mount Joy Road, Manheim, PA 17545. www.AandMhardware.com
 - 2. Concealed vertical support without upper extension (C) and as shown.
 - 3. Support arm length: as shown.
 - 4. Color: as selected.
 - 5. Accessories: Include mounting hardware.

PART 3 EXECUTION

3.01 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. Field weld components indicated .
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized .

3.02 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

SECTION 05 51 00
METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 1000, 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.
- B. Stairs with concrete treads.
- C. Structural steel stair framing and supports.

1.02 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.
- B. Section 05 7113 - Fabricated Spiral Stairs
- C. Section 05 52 13 - Pipe and Tube Railings: Metal handrails for the stairs specified in this section.

1.03 REFERENCE STANDARDS

- A. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2012.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2012.
- E. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2010.
- F. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2009.
- G. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.
- H. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.
- I. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (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.
 - 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.

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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Unit Stair Towers:
1. Alfab, Inc.; : www.alfabinc.com.
 2. American Stair, Inc.; : www.americanstair.com.
 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 METAL STAIRS - GENERAL

- A. Metal Stairs (Basis of Design): Provide stairs of American Stair, Inc., 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. Structural Design: Provide complete stair and railing assemblies complying with the applicable local code.
 3. At exit stairwells, provide unit stair towers designed for stacking to height of building as a self-supporting structure.
 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 concrete fill.
1. Tread Thickness: 1-1/2 inch, minimum.
 2. Tread Pan Material: Steel sheet.
 3. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch minimum.

4. Pan Anchorage to Stringers: Continuously welded, from top or bottom.
 5. Concrete Reinforcement: None.
 6. Concrete Finish: For resilient floor covering.
- D. Risers: Steel sheet.
1. Riser Thickness: As required by design; 14 gage, 0.075 inch minimum.
 2. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.
 3. Nosing Depth: Not more than 1 inch overhang.
 4. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.
- E. Stringers: Rolled steel channels.
1. Stringer Depth: As indicated on drawings.
 2. End Closure: Sheet steel of same thickness as risers welded across ends.
- F. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.
- G. Finish: Shop- or factory-prime painted.

2.04 HANDRAILS AND GUARDS

- A. Wall-Mounted Rails: As specified in Section 05 52 13.

2.05 MATERIALS

- A. Steel Sections: ASTM A 36/A 36M.
- B. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.
- C. 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).
- D. Concrete Fill: Portland cement Type I, 3000 psi 28 day strength, 2 to 3 inch slump.
- E. Concrete Reinforcement: Mesh type, unfinished.
- F. Steel Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.
- G. Welding Materials: AWS D1.1; type required for materials being welded.
- H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.06 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.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. When field welding is required, clean and strip primed steel items to bare metal.
- B. Supply items required to be embedded in masonry with setting templates.

3.03 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.

- B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.
- C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1.
- E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.
- F. Obtain approval prior to site cutting or creating adjustments not scheduled.
- G. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 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 52 13
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Wall mounted handrails.
- C. Free-standing railings at steps and ramps.
- D. Platform railings and guardrails.
- E. Removable railings.

1.02 RELATED REQUIREMENTS

- A. Section 05 51 00 - Metal Stairs: Attachment plates for handrails specified in this section.

1.03 REFERENCE STANDARDS

- A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels; 2002.
- B. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a.
- C. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2010.
- D. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube; 2010.
- E. ASTM B483/B483M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Tubes and Pipe for General Purpose Applications; 2003.
- F. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).
- G. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).
- H. SSPC-Paint 15 - Steel Joist Shop Paint; The Society for Protective Coatings; 1999 (Ed. 2004).

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
- C. Samples: Submit two, 6 inch long samples of stainless steel handrail. Submit two samples of elbow, wall bracket, and end stop.

PART 2 PRODUCTS

2.01 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 E 935.

- 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 E 935.
- D. Allow for expansion and contraction of members and building movement without damage to connections or members.
- E. Dimensions: See drawings for configurations and heights.
 - 1. Wall Rails and Handrails: 1-1/2 inch round.
- F. 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.
- G. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 ALUMINUM MATERIALS

- A. Aluminum Pipe: Schedule 40; ASTM B429/B 429M, ASTM B241/B 241M, or ASTM B483/B 483M.
- B. Aluminum Tube: Minimum wall thickness of 0.127 inch; ASTM B429/B 429M, ASTM B241/B 241M, or ASTM B483/B 483M.
- C. Welding Fittings: No exposed fasteners; cast aluminum.

2.03 STEEL RAILING SYSTEM

- A. Steel Tube: ASTM A 500, Grade B cold-formed structural tubing.
- B. Stainless Steel Tube: Type 304, 18-8, with a No. 4 satin finish, 1-1/2 inch, schedule 5.
- 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 welding collars.
- F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.04 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 continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 - 2. Interior Components: Continuously seal joined pieces by continuous welds.
 - 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.

2.05 ALUMINUM FINISHES

- A. Pigmented Organic Coating System: AAMA 2603 polyester or acrylic baked enamel finish.
- B. Color: As shown on drawings.

- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 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.
- C. Apply one coat of bituminous paint to concealed aluminum surfaces that will be in contact with cementitious or dissimilar materials.

3.02 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. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.
- E. Conceal anchor bolts and screws whenever possible.

3.03 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.

3.04 SCHEDULE

- A. Stairs, ramps and asiles in public areas: Stainless steel round tube handrail as detailed.
- B. Catwalks, Back-of-House areas: Primed steel guard rail, handrail, posts as detailed.
- C. Orchestra Pit: Square and rectangular aluminum tube guardrail with plastic laminate panels, constructed in removable sections set in sleeves.

END OF SECTION

SECTION 05 53 05
METAL GRATINGS AND FLOOR PLATES

PART 1 GENERAL

1.01 SUMMARY

- A. Catwalk framing and walkways.

1.02 PERFORMANCE REQUIREMENTS

- A. Conform to applicable code for loading requirements.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide span and deflection tables.
- C. Shop Drawings: Indicate details of component supports, openings, perimeter construction details, and tolerances.

1.04 QUALITY ASSURANCE

- A. Designer Qualifications: Design gratings and plates under direct supervision of a Professional Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Steel For Welding or Riveting: ASTM A36/A36M, galvanized, of rectangular shape.
- B. Steel Framing: ASTM A36/A36M shapes, unfinished.
- C. Cross Bars: ASTM B211 (ASTM B211M) solid bars.
- D. Welding Materials: AWS D1.1; type required for materials being welded.
- E. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

- A. Grating Type: NAAMM MBG 531, Welded Type.

2.03 FINISHES

- A. Galvanizing for Steel Shapes: ASTM A123/A123M.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install components in accordance with manufacturer's instructions.
- B. Place frames in correct position, plumb and level.

END OF SECTION

SECTION 05 71 13
FABRICATED SPIRAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 1000, 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.
- B. Metal Spiral Stairs.

1.02 RELATED SECTIONS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 05 50 00 - Metal Fabrications.
- C. Section 05 51 00 - Metal Stairs.

1.03 REFERENCES

- A. ASTM C 1028 - Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method; 1996.
- B. AWS D 1.1 - Structural Welding Code - Steel; 2002.
- C. NAAMM AMP 510 - Metal Stairs Manual; 1992, Fifth Edition.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- 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 methods.
- C. Shop Drawings: Submit shop drawings for stairs and railings.
 - 1. Include plans, elevations, and details.
 - 2. Indicate floor opening details, including floor opening and stair height tolerances.
 - 3. Show connection and accessory items and locations for anchor and bolt installation.
 - 4. Include design loads, structural calculations and material properties.
 - 5. Shop drawings shall be signed and sealed by a structural engineer licensed in the state in which Project is located.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm that has produced types of stair and railing systems required for not less than ten years, with not less than five similar projects that have been successful use for not less than five years.
- B. Installer Qualifications: Minimum five years experience in successful installation of stair and railing systems of type specified.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store in a weathertight location and protect from corrosion, distortion and other damage during delivery storage and handling.

1.07 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 absolute limits.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design:
 - 1. Stairways, Inc., 4166 Pinemont ; Houston, TX 77018; Tel: 800-231-0793; Email: markanderson@stairwaysinc.com; Web: www.stairwaysinc.com
- B. Providing compliance with the specifications the following are also acceptable:
 - 1. Spiral Stairs of America, 1700 Spiral Court, Erie, PA 16510; 800-422-3700; Email info@spiralstairsofamerica.com; Web: www.spiralstairsofamerica.com.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.02 SPIRAL STAIRS

- A. Spiral Stairs: Designed by stair manufacturer for applicable code requirements for live and dead loads, dimensions, and other requirements.
 - 1. Type Metal structure, preassembled; designed in accordance with NAAMM Metal Stairs Manual.
 - 2. Spiral Direction: Counterclockwise rotation.
 - 3. Stair Well: Custom shape, see drawings.
 - 4. Provide platforms with integral nosings matching tread nosings.
 - 5. Provide custom well rail matching stair balusters and see drawings for extent.
- B. Treads and Landings: Checker plate.
 - 1. Material: Steel.
 - 2. Thickness: 12 gage.
 - 3. Landings: Steel.
 - 4. Provide nosing on leading edge.
- C. Handrails: Round.
 - 1. Material: Steel.
 - 2. Diameter: 1-1/2 inches (38 mm).
- D. Balusters: Metal.
 - 1. Material: Steel.
 - 2. Cross-Section: 1/2 inch (13 mm) square.
 - 3. Provide one baluster per tread, centered.
- E. Center Column: Round metal pipe or tube.
 - 1. Material: Steel.
 - 2. Diameter: As required for specified loading.
 - 3. Base Plate: 10 inches (254 mm) square, 1/4 inch (6 mm) thick.
 - 4. Column Cap: Match material and finish of column.
- F. Stringers and Landing Framing:
 - 1. Material: Same as tread materials.
 - 2. Size and Shape: As indicated on drawings.
 - 3. Provide connections and other components necessary for support and installation of stairs.
- G. Finishes:

1. Steel:
 - a. Manufacturer's standard prime paint finish.

2.03 MATERIALS

- A. Fasteners and Anchorage Devices: Type as recommended by stair and railing system manufacturer.
- B. Welding Materials: Type required for materials being welded.
- C. Grout: Non-metallic, non-shrink grout, premixed, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents.

2.04 FABRICATION

- A. Fabricate to shapes and configurations indicated in Contract Documents.
- B. Preassembled Stairs: Fabricate in largest practical sizes for handling through building openings; ship fully assembled except where access to installation area is restricted.
- C. Mark units for reassembly and coordinated installation.
- D. Form elbow bends and wall returns to uniform radius, free from buckles and twists, and with smooth finished surfaces free from blemishes. Form exposed ends to match or provide matching prefabricated end fittings.
- E. Join components with concealed fastener. Countersink fasteners that cannot be concealed.
- F. Welded Connections: Cope and weld or use welded-in fittings. Weld connections continuously. Remove sharp or rough edges on exposed surfaces.
- G. Welded Connections for Pipe Railings: Connect handrail and railing members with sleeve and socket fittings with concealed internal welds.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are acceptable to suit stair assembly tolerances.
- B. Verify supports and anchors are correctly and securely positioned.
- C. Start of installation constitutes installer's acceptance of substrate and conditions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings.
- B. Install stair assembly in accordance with manufacturer's instructions and approved shop drawings and in accordance with specified performance requirements.
- C. Anchor components rigidly and securely to building structure, plumb and level, accurately fitted, and free from distortion or defects.
- D. Fit exposed connections to form tight hairline joints.
- E. Weld connections that cannot be shop welded because of size limitations.
 1. Perform field welding of steel in accordance with AWS D 1.1. Field bolt and weld to match shop bolting and welding.
 2. Clean field welds, bolted connections and abraded areas.
 3. Touch up shop primer.

3.03 ERECTION TOLERANCES

- A. Maximum Variation from Plumb: 1/4 inch (6 mm) for full height of stair.
- B. Maximum Variation from Level: 1/8 inch (3 mm).
- C. Maximum Angular Variation of the Tread from True Position: 3 degrees.

3.04 PROTECTION

- A. Do not permit traffic on the stair after installation.
- B. Protect installed products until completion of project.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Roof-mounted curbs.
- C. Roofing nailers.
- D. Fire retardant treated wood materials.
- E. Communications and electrical room mounting boards.
- F. Concealed wood blocking, nailers, and supports.

1.02 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and application instructions.

1.03 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. 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.
 - 2. 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; see Section 01 60 00 for requirements.
- D. Provide wood harvested within a 500 mile radius of the project site; see Section 01 60 00 for requirements for locally-sourced products.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.
- C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

- A. Subfloor/Underlayment Combination: APA PRP-108, Rated Sturd-I-Floor.

1. Exposure Class: Exterior.
 2. Span Rating: 16 inches.
 3. Thickness: 3/4 inches, nominal.
 4. Edges: Square.
- B. 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.
- C. Other Applications:
1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
 2. Other Locations: PS 1, C-D Plugged or better.

2.04 ACCESSORIES

- A. Fasteners and Anchors:
1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
- B. Subfloor Glue: Waterproof, water base, air cure type, cartridge dispensed.

2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWWA 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.
- B. Fire Retardant Treatment:
1. Interior Type A: AWWA 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.

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. 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.
- B. 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.
- C. Install structural members full length without splices unless otherwise specifically detailed.
- D. 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.

- E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

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.

3.04 INSTALLATION OF CONSTRUCTION PANELS

- A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.
- B. 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.

3.05 CLEANING

- A. Waste Disposal: Comply with the requirements of Section 01 74 19.
 - 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. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Finish carpentry items.
- C. Plastic laminate paneling and trim.
- D. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 09 54 00 - Acoustical Wood Panels

1.03 REFERENCE STANDARDS

- A. ANSI A135.4 - American National Standard for Basic Hardboard; 2004.
- B. ANSI A208.1 - American National Standard for Particleboard; 2009.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.
- D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.
- E. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; Hardwood Plywood & Veneer Association; 2004.
- F. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.
- G. PS 1 - Structural Plywood; 2007.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Sequence installation to ensure 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:
 - 1. Provide data on fire retardant treatment materials and application instructions.
 - 2. Provide instructions for attachment hardware and finish hardware.
- C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Provide the information required by AWI/AWMAC/WI Architectural Woodwork Standards.
- D. Samples: Submit two samples of finish plywood, 12 x 12 inch in size illustrating wood grain and specified finish.
- E. Samples: Submit two samples of wood trim 12 inch long.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect work from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

- A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI Architectural Woodwork Standards for Premium Grade.
- B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.
- C. Interior Woodwork Items:

2.02 LUMBER MATERIALS

- A. Hardwood Lumber: Red Oak species, plain sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.

2.03 SHEET MATERIALS

- A. Softwood Plywood Not Exposed to View: Any face species, veneer core; PS 1 Grade A-B; glue type as recommended for application.
- B. Hardwood Plywood: Face species Maple, plain sawn, book matched, particleboard core; HPVA HP-1, Grade AA, Type I; glue type as recommended for application.

2.04 SOLID SURFACE MATERIALS

- A. Solid Surfacing Material: Solid surfacing sheet or plastic resin casting over continuous substrate.
 - 1. Flat Sheet Thickness: 1/2 inch, minimum.
 - 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISSFA-2 and NEMA LD 3; acrylic or polyester resin, unfilled, 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. Surface Burning Characteristics: Flame spread 25, maximum; smoke developed 450, maximum; when tested in accordance with ASTM E84.
 - 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.
 - d. Manufacturers:
 - 1) Dupont : www.corian.com.
 - 2) Formica Corporation : www.formica.com.
 - 3) Wilsonart International, Inc : www.wilsonart.com.
 - 4) Substitutions: See Section 01 60 00 - Product Requirements.

2.05 PLASTIC LAMINATE MATERIALS

- A. Plastic Laminate: NEMA LD 3, HGS ; textured, low gloss finish .
- B. Laminate Backing Sheet: NEMA LD 3, BKL; undecorated plastic laminate.
- C. Laminate Adhesive: Type recommended by laminate manufacturer to suit application; not containing formaldehyde or other volatile organic compounds.

2.06 FASTENINGS

- A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.
- B. Fasteners: Of size and type to suit application; zinc plated finish in concealed locations and stainless steel finish in exposed locations.

- C. Concealed Joint Fasteners: Threaded steel.
- D. Security fasteners at plastic laminate panels at Orchestra Pit Removable Rail: Stainless steel hex head bolts and nuts, metric size M6, with aromr ring.
 - 1. Manufacturer: Fastenright, LTD, Ward Street, Wolverhampton, West Midlands, WV1 3LT, United Kingdom; Tel: +44(0)1902 457734; Fax:+44(0)1902 457526; Email:sales@fastenright.com; Skype: fastenright.

2.07 ACCESSORIES

- A. Aluminum Edge Trim: Extruded angle and channel shapes; smooth surface finish; of width to match component thickness; clear anodized finish.
 - 1. Manufacturer: Fry Reglet

2.08 WOOD TREATMENT

- A. Fire Retardant Treatment (FR-S Type): Chemically treated and pressure impregnated; capable of providing flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.

2.09 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. Cap exposed plastic laminate finish edges with aluminum trim.
- C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.
- E. Apply laminate backing sheet to reverse face of plastic laminate finished surfaces.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards 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.

3.02 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 20 13
FRAMED DECORATIVE PANEL SYSTEMS

PART 1 PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Decorative 3/4" (1.91cm) thick prefinished panel, pre-engineered clip application hardware and trim system held in place in metal frames having attachment clips, for installation direct to studs or solid substrate.
 - 1. Hardware: Aluminum cross rails with cross splines.
 - 2. Panels:
 - a. Faux Print finish (Simulated Wood Grain) applied by offset gravure print process utilizing solid color oven-baked base paints, ink overprints and oven-baked protective topcoat.
- B. Products Not Furnished or Installed under This Section:
 - 1. Wood Veneer casework.
 - 2. Gypsum board backup.

1.02 RELATED SECTIONS

- A. Section 06 1000 - Rough Carpentry.
- B. Section 09 2116 - Gypsum Board Assemblies.

1.03 REFERENCES

- A. American Society for Testing and Materials: Standard Specifications (ASTM)
 - 1. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. Architectural Woodwork Standards as published by the Architectural Woodwork Institute, the Architectural Woodwork Manufacturers Association of Canada, and the Woodwork Institute.
 - 1. Architectural Woodwork Standards - Edition 1.

1.04 SUBMITTALS

- A. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.
- C. Selection Samples: Submit manufacturer's standard color and pattern selection samples representing manufacturer's full range of available colors and patterns.
- D. Samples for Verification: Submit sample for each component and for each exposed finish required, prepared on samples of size indicated below complete with exposed molding and trim samples. Sample to indicate type, finish, and color specified.
 - 1. Prints: Submit 6" (154mm) by 10" (254mm) section of panel for each panel selected indicating the color, texture, and pattern required.
 - a. Submit complete with specified applied finish.
 - b. For selected patterns show complete pattern repeat.
- E. Manufacturers Material Safety Data Sheets (MSDS) for adhesives, sealants and other pertinent materials prior to their delivery to the site.

F. Maintenance Instructions

1.05 QUALITY ASSURANCE

- A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:
 - 1. ASTM E 84 (Method of test for surface burning characteristics of building Materials)
 - 2. Required Rating - Class [A] [C].

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver panels and associated materials factory packaged on strong pallets and properly packaged or protected.
 - 1. Upon delivery carefully inspect all cartons, packages, pallets and protective wrap for damage or material shortage.
 - 2. Open and inspect suspect packages, cartons or wrapped pallets for damage.
 - 3. Contact shipper immediately to report any damaged or missing materials.
- B. Store products in manufacturer's unopened packaging until ready for installation.
 - 1. Maintain plastic or other protective wrap in place during on site handling until ready for installation.
 - 2. Keep panels clean and do not stack panels after removal of protection.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 PROJECT CONDITIONS

- A. Wood composite panels are subject to the effects of humidity and temperature. Do not use in kitchens, rest rooms, or other high humidity areas.
- B. Partition walls are to be finished and the building completely closed. Walls shall be thoroughly dry and concrete cured and dry before starting installation.
- C. HVAC system must be operable and installation area must be balanced to normal operating conditions.
- D. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. To ensure product performance, a temperature range of 60°-80°F (16°C-27°C) and a humidity range of 35-55% must be maintained during storage, installation and product life cycle. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 COORDINATION AND SEQUENCING

- A. Except as specified by the architect, it's recommended to locate trim members so that panel lines coordinate with doors, headers, jambs and other discontinuities in a wall.
- B. Vapor barrier shall be used on exterior walls behind backing to discourage warping.
- C. Coordinate with casework manufacturer. Deliver material to the fabrication shop.

1.09 WARRANTY

- A. Standard Warranty: All products shall be warranted to be free from defects for a period of 30 days after installation.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Marlite; 202 Harger Street, Dover, OH 44622. 800-377-1221 FAX (330) 343-4668 Email: info@marlite.com www.marlite.com. Product: Surface Systems - MAP System.
- B. Substitutions: See Section 016000 - Product Requirements

2.02 HARDWARE

- A. Horizontal Main Rail and vertical Cross Spline alignment framing.
 - 1. HMR - Hidden Main Rail, to create detailed 1/16" reveals. Furnished in full 8' - 0" (2.44m) lengths.
 - 2. NMR - Narrow Main Rail, to create detailed 1/4" reveals. Furnished in full 8' - 0" (2.44m) lengths.
 - 3. CMR - Channel Main Rail, to create detailed 1/2" reveals. Furnished in full 8' - 0" (2.44m) lengths.
 - 4. BMR - Broad Main Rail, to create detailed 1" reveals. Furnished in full 8' - 0" (2.44m) lengths.
 - 5. HCS - Hidden Cross Spline, to create detailed 1/16" reveals. Furnished cut-to-size to match panel.
 - 6. NCS - Narrow Cross Spline, to create detailed 1/4" reveals. Furnished cut-to-size to match panel.
 - 7. CCS - Channel Cross Spline, to create detailed 1/2" reveals. Furnished cut-to-size to match panel.
 - 8. BCS - Broad Cross Spline, to create detailed 1" reveals. Furnished cut-to-size to match panel.
- B. Panel Trim: Aluminum Profiles furnished in full 10' - 0" (3.05 meters) lengths
 - 1. Outside Corner - As indicated on drawings.
 - 2. Edge/Inside Corner - As indicated on drawings.
- C. Hardware and Trim Material:
 - 1. Aluminum - Heavy weight extruded aluminum 6063-T5 alloy and prefinished at the factory.
 - a. Concealed Aluminum - Mill finish.
 - b. Exposed Aluminum - Clear anodized.

2.03 PANELS

- A. Panel Configuration:
 - 1. Face dimensions: As indicated on drawings.
 - 2. Panel thickness - 3/4" (1.9cm) thick.
- B. Wood Fiber Substrate:
 - 1. Medium density wood fiberboard conforming to ANSI A208.2, industrial-grade MDF or other wood fiber substrates having not less than 75% recycled wood waste
 - 2. Medium density wood fiberboard conforming to ANSI A208.2, industrial-grade MDF and having No-Added Formaldehyde.
- C. Marlite Azure Wood Grain pattern panels; applied using direct digital imaging to wood fiber substrate including seal coats, color inks and protective topcoats.
 - 1. Edges - Square, and sealed
 - 2. Color and Pattern: As selected by Architect from manufacturer's standard selection.

2.04 ADHESIVES

- A. Marlite Brand C-109 solvent based adhesive or as otherwise approved by Marlite.

2.05 FABRICATION

- A. All framing, panels, hardware and accessories shall be factory finished and ready to install except for field fabrication as required by jobsite and perimeter conditions.
 - 1. Refinish field cut panel edges in accordance with manufacturer's instruction before installation.
 - 2. For all cut-outs, drill corners for a minimum 1/8" radius.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Installer's Examination: Examine conditions under which construction activities of this section are to be performed. Submit written notification to Architect and system manufacturer if such conditions are unacceptable. Beginning erection constitutes installer's acceptance of conditions.
 - 1. Verify that a vapor barrier has been provided on exterior walls behind backing to prevent warping.
 - 2. Verify backing panels are smooth, solid, and flat. All drywall joints are to be taped and finished.
 - 3. Verify that walls are primed before installation begins.
 - 4. Verify mechanical, electrical, and building service and/or items affecting work of this section are placed and ready to receive this work.
 - 5. Verify that stud spacing does not exceed 24" on-center.
- B. Structural walls are to be finished, with building completely closed. Walls shall be thoroughly dry before starting installation.

3.02 PREPARATION

- A. Conditioning: Panels must be allowed to acclimate to a balanced environment in the installation location for 72 hours prior to installation.
- B. Protect existing surfaces with drop cloths.
- C. Except as directed by the architectural drawings, before installing, examine panels and arrange to achieve best combination of color, pattern, texture and grain.

3.03 INSTALLATION

- A. Install all materials in strict accordance with the manufacturer's installation instructions with hardware straight, plumb, and level.
 - 1. Anchor units rigidly and securely in place.
 - 2. Cut sheets to meet existing supports.
- B. Fasten supports and trim using #6 trim-head screws anchored into a stud or other solid substrate at 16" (40.64cm) centers. Where screws do not hit the studs, fasten with adhesive in accordance with the manufacturer's recommendations. Pre-drill holes thru the members and fasten the screw flush with the flange on the aluminum profile. Where necessary countersink for the screw head to seat flush with the flange.
- C. Avoid contamination of the panel faces with adhesives, solvents or cleaners during installation.

3.04 CLEANING AND PROTECTION

- A. Clean and remove dust and other foreign matter from panel and framing surfaces. Clean finishes in accordance with manufacturer's instructions.

END OF SECTION

SECTION 07 13 00
SHEET WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 1000, 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.
- B. Sheet membrane waterproofing.
 - 1. Continuous horizontal sheet waterproofing below elevator pit floor and vertical sheet waterproofing on elevator pit walls, with accessories including protection board, drainage board and waterstop materials.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete substrate.

1.03 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers- Tension; 2006a.
- B. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2010).
- C. ASTM D5295 - Standard Guide for Preparation of Concrete Surfaces for Adhered (Bonded) Membrane Waterproofing Systems; 2000 (Reapproved 2006).
- D. ASTM E96/E96M - Standard Test Methods For Water Vapor Transmission of Materials; 2010.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for membrane, surface conditioner, flexible flashings, joint cover sheet, and joint and crack sealants.
- C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Membrane Manufacturer Qualifications: Company specializing in waterproofing sheet membranes with ten years experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience.

1.06 FIELD CONDITIONS

- A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water .

PART 2 PRODUCTS

2.01 WATERPROOFING APPLICATIONS

- A. Self-Adhered Modified Bituminous Sheet Waterproofing: Use at interior concrete and CMU walls below grade in Auditorium..
 - 1. Cover with protection board.

2.02 MANUFACTURERS

- A. Laminated Composite Manufacturers:
 - 1. Grace Construction Products: www.na.graceconstruction.com.
 - a. Bituthene® System 4000 Membrane - Vertical application.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 MEMBRANE MATERIALS

- A. Self-Adhered Modified Bituminous Membrane: Vertical application at CMU and Cast-in-place concrete walls.
 - 1. Thickness: 60 mil (0.060 inch).
 - 2. Sheet Width: 36 inches.
 - 3. Tensile Strength:
 - a. Membrane: 5000 pounds per square inch, minimum, measured according to ASTM D882.
 - b. Film: 325 pounds per square inch, minimum, measured according to ASTM D412.
 - 4. Elongation at Break: 300 percent, minimum, measured according to ASTM D412.
 - 5. Water Vapor Permeance: 0.05 perm, maximum, measured in accordance with ASTM E96/E96M.
 - 6. Peel Strength: 9 pounds per inch, minimum, when tested according to ASTM D903.
 - 7. Adhesives, Sealants, Tapes, and Accessories: As recommended by membrane manufacturer.
 - 8. Manufacturers:
 - a. Grace Construction Products; Product Bituthene® System 4000 Membrane : www.na.graceconstruction.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

- A. Protection Board: 1/8 inch thick biodegradable hardboard .
- B. Drainage Panel: 1/4 inch thick formed plastic, hollowed sandwich .
- C. Flexible Flashings: Type recommended by membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.
- C. Verify that items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

- A. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.
- B. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.

- C. Seal cracks and joints with sealant using depth to width ratio as recommended by sealant manufacturer.
- D. Concrete Surfaces for Adhesive Bonding: Prepare concrete substrate according to ASTM D5295.
 - 1. Remove substances that inhibit adhesion including form release agents, curing compounds admixtures, laitance, moisture, dust, dirt, grease and oil.
 - 2. Repair surface defects including honeycombs, fins, tie holes, bug holes, sharp offsets, rutted cracks, ragged corners, deviations in surface plane, spalling and delaminations, as described in the reference standard.
 - 3. Remove and replace areas of defective concrete as specified in Section 03 30 00.
 - 4. Prepare concrete for adhesive bonded waterproofing using mechanical or chemical methods described in the referenced standard.
 - 5. Test concrete surfaces as described in the referenced standards. Verify surfaces are ready to receive adhesive bonded waterproofing membrane system.

3.03 INSTALLATION - MEMBRANE

- A. Install membrane waterproofing in accordance with manufacturer's instructions.
- B. Roll out membrane. Minimize wrinkles and bubbles.
- C. Self-Adhering Membrane: Remove release paper layer. Roll out on substrate with a mechanical roller to encourage full contact bond.
- D. Overlap edges and ends and seal by method recommended by manufacturer, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.
- F. Weather lap joints on sloped substrate in direction of drainage. Seal joints and seams.
- G. Install flexible flashings. Seal items penetrating through membrane with flexible flashings. Seal watertight to membrane.
- H. Seal membrane and flashings to adjoining surfaces. Install termination bar at all edges.

3.04 INSTALLATION - DRAINAGE PANEL AND PROTECTION BOARD

- A. Place drainage panel directly against membrane, butt joints, place to encourage drainage downward. Scribe and cut boards around projections, penetrations, and interruptions.
- B. Place protection board directly against drainage panel; butt joints. Scribe and cut boards around projections, penetrations, and interruptions.
- C. Adhere protection board to substrate with compatible adhesive.

3.05 FIELD QUALITY CONTROL

- A. On completion of horizontal membrane installation, dam installation area in preparation for flood testing.
- B. Flood to minimum depth of 1 inch with clean water. After 48 hours, inspect for leaks.
- C. If leaking is found, remove water, repair leaking areas with new waterproofing materials as directed by Architect; repeat flood test. Repair damage to building.
- D. When area is proven watertight, drain water and remove dam.

3.06 PROTECTION

- A. Do not permit traffic over unprotected or uncovered membrane.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Batt insulation for filling acoustical partitions.
- C. Fire Resistive Joint Systems.
- D. Firestopping of Through Penetrations

1.02 REFERENCE STANDARDS

1.03 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.

1.04 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.

2.02 BATT INSULATION MATERIALS

- A. Insulation Type 5: Acoustical
 - 1. Thickness: As noted on contract drawings.
 - 2. Type: Thermafiber Sound Attenuation Fire Blanket (SAFB).
 - a. Facing: Unfaced.
 - b. Density: 4 pcf (nominal) for 1" thick material.
 - c. Density: 2.5 pcf (nominal) for thicknesses greater than 1".
 - d. Surface-Burning Characteristics: ASTM E 84. Unfaced material will have a maximum flame spread 0 and smoke-developed of 0. Foil Faced material will have maximum flame spread 25 and smoke-developed of 0.
 - 3. Manufacturers:
 - a. Thermafiber, Inc: www.thermafiber.com.
- B. Insulation Type 6: Fire safing insulation.
 - 1. Type: Thermafiber FireSpan 40 Insulation.
 - a. R-Value: 4.2 per inch.
 - b. Facing: Unfaced.
 - c. Density: 4.0 pcf (nominal).
 - d. Surface-Burning Characteristics: ASTM E 84. Unfaced material will have a maximum flame spread 0 and smoke-developed of 0. Foil Faced material will have maximum flame spread 25 and smoke-developed of 0.
 - 2. Manufacturers:
 - a. Thermafiber, Inc: www.thermafiber.com.

b. Manufacturers:

- 1) Thermafiber, Inc: www.thermafiber.com.

2.03 ACCESSORIES

- A. Tape: Black self-adhering type, mesh reinforced, 2 inch wide.
- B. Adhesive: Type recommended by insulation manufacturer for application.
- C. Safing Clips: No. 12 SWGspring steel studs with No. 26 MSGgalvanized steel, 1-1/2 inch diam. round clinch shields. Application and spacing as tested in UL Design.

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 .
- B. Verify substrate surfaces are flat, free of irregularities.

3.02 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in exterior wall 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. Tape insulation batts in place.
- G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
- H. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.
- I. Tape seal tears or cuts in vapor retarder.
- J. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

3.03 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 26 16

UNDER-SLAB VAPOR BARRIER/RETARDER

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Vapor Barrier, seam tape, mastic, pipe boots, detail strip for installation under concrete slabs.

1.02 RELATED SECTIONS

- A. Section 03300 Cast-in-place Structural Concrete

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM E 1745-97(2004) Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
 - 2. ASTM E 154-99(2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs
 - 3. ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials
 - 4. ASTM E 1643-98(2005) Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

1.04 SUBMITTALS

- A. Quality Control / Assurance
 - 1. Independent laboratory test results showing compliance with ASTM & ACI Standards.
 - 2. Manufacturer's samples, literature
 - 3. Manufacturer's installation instructions for placement, seaming and pipe boot installation

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Vapor Barrier
 - 1. Vapor Barrier must have the following qualities
 - a. Perm rating less than or equal to 0.01 perms (grains/(ft² *hr * in. Hg)) after conditioning as tested by:
 - 1) ASTM E 96
- B. Vapor Barrier Products
 - 1. Stego Wrap (15 mil) Vapor Barrier by STEGO INDUSTRIES LLC, San Clemente, CA (877) 464-7834 www.stegoindustries.com
 - 2. Griffolyn 15 mil Green Vapor Barrier by Reef Industries, Inc.
 - 3. VaporBlock 15 by Raven Industries, Inc.
- C. ACCESSORIES
 - 1. Seam Tape
 - a. Tape must have the following qualities:
 - 1) Water Vapor Transmission Rate ASTM E 96: 0.3 perms or lower
 - 2. Vapor Proofing Mastic
 - a. Mastic must have the following qualities:
 - 1) Water Vapor Transmission Rate ASTM E 96: 0.3 perms or lower
 - 3. Pipe Boots

- a. Provide manufacturer's supplied pipe boot system or construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Ensure that subsoil is approved by architect or geotechnical firm
 1. Level and tamp or roll aggregate, sand or tamped earth base.

3.02 INSTALLATION

- A. Install Vapor Barrier/Retarder:
 1. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643.
 - a. Unroll Vapor Barrier/Retarder with the longest dimension parallel with the direction of the pour.
 - b. Lap Vapor Barrier/Retarder over footings and seal to foundation walls.
 - c. Overlap joints 6 inches and seal with manufacturer's tape.
 - d. Seal all penetrations (including pipes) per manufacturer's instructions.
 - e. No penetration of the Vapor Barrier/Retarder is allowed except for reinforcing steel and permanent utilities.
 - f. Repair damaged areas by cutting patches of Vapor Barrier/Retarder, overlapping damaged area 6 inches and taping all four sides with tape.

END OF SECTION

SECTION 07 53 00
ELASTOMERIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Elastomeric roofing membrane, adhered conventional application.
- C. Insulation, flat and tapered.
- D. Flashings.
- E. Roofing 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 07 62 00 - Sheet Metal Flashing and Trim: Counterflashings .

1.03 REFERENCE STANDARDS

- A. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2012.
- B. FM DS 1-28 - Wind Design; Factory Mutual Research Corporation; 2007.
- C. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association; Fifth Edition, with interim updates.
- D. UL (RMSD) - Roofing Materials and Systems Directory; Underwriters Laboratories Inc.; current edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. 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 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 and conditions of interface with other materials.
- D. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
- E. Manufacturer's Field Reports: Indicate procedures followed and supplementary instructions given.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

- C. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
- B. Store products in weather protected environment, clear of ground and moisture.
- C. Protect foam insulation from direct exposure to sunlight.

1.08 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 95 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.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. EPDM Membrane Materials:
 - 1. Carlisle Roofing Systems, Inc; Sure-Seal EPDM: www.carlisle-syntec.com.
 - 2. Firestone Building Products, LLC: www.firestonebpco.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Insulation:
 - 1. Atlas Roofing Corporation: www.atlasroofing.com.
 - 2. Basis of Design: Carlisle SynTec.

2.02 ROOFING

- A. Elastomeric Membrane Roofing: Existing single ply membrane, fully adhered, over insulation.
- B. Roofing Assembly Requirements:
 - 1. Repair and patching existing roof.
 - 2. Roof Covering External Fire-Resistance Classification: UL Class A.
 - 3. Factory Mutual Classification: Class I and windstorm resistance of I-90, in accordance with FM DS 1-28.
- C. Acceptable Insulation Types - Constant Thickness Application: Any of the types specified.
 - 1. Minimum 2 layers of polyisocyanurate board.

2.03 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

- A. Membrane: Ethylene-propylene-diene-terpolymer (EPDM); non-reinforced; complying with minimum properties of ASTM D 4637.
 - 1. Thickness: 0.060 inch.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Membrane Color: Black
- D. Membrane Thickness: 60 mil.

- E. Flexible Flashing Material: Same material as membrane; conforming to the following:
 - 1. Thickness: 90 mil.
 - 2. Tensile Strength: 1,200 psi.
 - 3. Elasticity: 50 percent with full recovery without set.
 - 4. Color: Black.

2.04 INSULATION

2.05 COVER BOARD

- A. Fiberglass Mat Gypsum Roof Board:
 - 1. Manufacturer: Georgia Pacific; Product: DensGlas Prime.
 - 2. Thickness: 1/2 inch.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 EPICHLOROHYDRIN (ECO/CO) MEMBRANE AND RELATED PRODUCTS

- A. Membrane designed to resist hydrocarbons, solvents, grease and oil, for use as a protective overlayment on EPDM roofing systems.
- B. Membrane Thickness: 0.060 inches.
- C. Sealants and Cleaners: Provide manufacturer required installation products, including:
 - 1. Specialty Membrane Cleaner.
 - 2. Splicing Cement.
 - 3. In-Seam Sealant.
 - 4. Lapp Sealant.

2.07 ACCESSORIES

- A. Prefabricated Roofing Expansion Joint Flashing: Sheet butyl over closed-cell foam backing seamed to galvanized steel flanges.
- B. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.
- C. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with roofing materials; 6 inches wide; self adhering.
- D. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
- E. Membrane Adhesive: As recommended by membrane manufacturer.
- F. Insulation Adhesive: As recommended by insulation 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 nailing strips are in place.

3.02 METAL DECK PREPARATION

- A. Install preformed sound absorbing glass fiber insulation strips in acoustic deck flutes. Install in accordance with manufacturer's instructions.

3.03 INSULATION - UNDER MEMBRANE

- A. Attachment of Insulation: Mechanically fasten each layer of insulation to deck in accordance with roofing manufacturer's instructions and Factory Mutual requirements.
- B. Adhesive Attachment of Insulation:
 - 1. Embed each layer of insulation in full bed of adhesive in accordance with roofing and insulation manufacturers' instructions.
- C. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.
- D. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.
- E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- F. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.
- G. Do not apply more insulation than can be covered with membrane in same day.

3.04 MEMBRANE APPLICATION

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Fully Adhered Application: Apply adhesive to substrate at manufacturer's required rate. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- 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. 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.
- F. Around roof penetrations, seal flanges and flashings with flexible flashing.
- G. Install roofing expansion joints where indicated. Make joints watertight.
 - 1. Install prefabricated joint components in accordance with manufacturer's instructions.
- H. Coordinate installation of roof drains and related flashings.
- I. Install oil resistant ECO/CO roof membrane overlay within 10 feet of kitchen exhaust systems.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field quality control and inspection.
- B. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.

3.06 CLEANING

- A. Remove bituminous markings from finished surfaces.
- B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
- C. 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

SECTION 07 54 00

THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Adhered system with thermoplastic roofing membrane.
- C. Insulation, flat and tapered.
- D. Flashings.
- E. Roofing stack boots, roofing expansion joints, and walkway pads.

1.02 REFERENCE STANDARDS

- A. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2012.
- B. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2011a.
- C. FM DS 1-28 - Wind Design; Factory Mutual Research Corporation; 2007.
- D. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association; Fifth Edition, with interim updates.
- E. UL (RMSD) - Roofing Materials and Systems Directory; Underwriters Laboratories Inc.; current edition.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, and fasteners.
- C. Specimen Warranty: For approval.
- D. Shop Drawings: Indicate joint or termination detail conditions and conditions of interface with other materials.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.
- G. Warranty: Submit manufacturer 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 five years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section:
 - 1. Approved by membrane manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
- B. Store products in weather protected environment, clear of ground and moisture.

- C. Protect foam insulation from direct exposure to sunlight.

1.06 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.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
 - 1. Warranty Term: 20 years.
 - 2. For repair and replacement include costs of both material and labor in warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Thermoplastic Polyolefin Membrane Materials:
 - 1. Carlisle Roofing Systems, Inc; Sure-Weld TPO: www.carlisle-syntec.com.
 - 2. Firestone Building Products, LLC; UltraPly TPO: www.firestonebpco.com.
 - 3. Versico, a division of Carlisle Construction Materials Inc; VersiWeld TPO: www.versico.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Insulation:

2.02 ROOFING - UNBALLASTED APPLICATIONS

- A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over insulation.
- B. Roofing Assembly Requirements:
 - 1. Roof Covering External Fire-Resistance Classification: UL Class A.
 - 2. Factory Mutual Classification: Class I and windstorm resistance of I-90, in accordance with FM DS 1-28.
 - 3. Insulation Thermal Value (R), minimum: 15; provide insulation of thickness required.
- C. Acceptable Insulation Types - Tapered Application: Any type that meets requirements and is approved by membrane manufacturer for application.

2.03 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

- A. Membrane:
 - 1. Material: Thermoplastic polyolefin (TPO) complying with ASTM D6878.
 - 2. Reinforcing: Internal fabric.
 - 3. Thickness: 0.060 inch, minimum.
 - 4. Sheet Width: Factory fabricated into largest sheets possible.
 - 5. Color: White.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Flexible Flashing Material: Same material as membrane.

2.04 INSULATION

- A. Polyisocyanurate Board Insulation: Rigid cellular foam, complying with ASTM C1289, Type II, Class 1, cellulose felt or glass fiber mat both faces; Grade 1 and with the following characteristics:
 - 1. Compressive Strength: 16 psi

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.
- B. Do not apply roofing membrane during unsuitable weather.
- C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.02 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.

3.03 INSULATION - UNDER MEMBRANE

- A. Attachment of Insulation:
 - 1. Mechanically fasten insulation to deck in accordance with roofing manufacturer's instructions and Factory Mutual requirements.
- B. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.
- C. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- D. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- E. Do not apply more insulation than can be covered with membrane in same day.

3.04 MEMBRANE APPLICATION

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Fully Adhered Application: Apply adhesive to substrate at rate of ____ gal/square. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- 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. 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.
- F. Around roof penetrations, seal flanges and flashings with flexible flashing.
- G. Coordinate installation of roof drains and sumps and related flashings.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field quality control and inspection.
- B. Require site attendance of roofing material manufacturers daily during installation of the Work.

3.06 CLEANING

- A. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
- B. 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

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Fabricated sheet metal items, including flashings, counterflashings, and other items indicated in Schedule.
- C. Precast concrete splash pads.

1.02 RELATED REQUIREMENTS

- A. Section 07 53 00 - Elastomeric Membrane Roofing: Roofing system.

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 2012.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.
- C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.
- D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012)e1.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. 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. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples: Submit two samples 6 x 6 inch in size illustrating metal finish color.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.

1.07 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 FLASHING TYPES

- A. Flashing Type 1: 2 piece interlocking type. Not Used.
- B. Flashing Type 2: Masonry thru-wall type: Not Used..

- C. Flashing Type 3: Roofing base flashing type: Refer to Section 07 53 00, Elastomeric Membrane Roofing.
- D. Flashing Type 4: Formed metal flashing (other than Type 1): Materials and locations specified below.

2.02 SHEET MATERIALS : COPINGS

- A. Aluminum: ASTM B209 (ASTM B209M); 0.032 inch thick; anodized finish of color as selected.
 - 1. Color Anodized Finish: AAMA 611 AA-M12C22A42/44 Class I integrally or electrolytically colored anodic coating not less than 0.7 mils thick.

2.03 ACCESSORIES

- A. Fasteners: Stainless steel .
- B. Underlayment: Self-adhering rubber-modified asphalt sheet complying with ASTM D 1970; 22 mil total thickness; with strippable release film and woven polypropylene sheet top surface.
- C. Primer: Zinc chromate type.
- D. Protective Backing Paint: Zinc molybdate alkyd.
- E. Sealant: Type 1 specified in Section 07 90 05.
- F. Plastic Cement: ASTM D4586, Type I.

2.04 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.

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. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
- B. Apply plastic cement compound between metal flashings and felt flashings.

- C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Seal metal joints watertight.
- E. Install snow guards up slope from eaves and valleys as shown.

END OF SECTION

SECTION 07 72 00
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 1000, 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.
- B. Manufactured curbs, equipment rails, and pedestals.
- C. Roof hatches, manual and automatic operation, including smoke vents.

1.02 RELATED REQUIREMENTS

- A. 07 53 00 Elastomeric Membrane Roofing

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.
- B. UL (BMD) - Building Materials Directory; current edition.

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.
 - 5. For smoke hatches, submit evidence of approval by evaluation agency specified.
- C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.
- D. Certificate: For smoke hatches, provide certificate of approval from authority having jurisdiction.

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.

PART 2 PRODUCTS

2.01 MANUFACTURED CURBS

- A. Manufactured Curbs, Equipment Rails, and Other Roof Mounting Assemblies:
Factory-assembled hollow sheet metal construction with fully mitered and welded corners, integral counterflashing, internal reinforcing, and top side and edges formed to shed water.
 - 1. Sheet Metal: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33 ; G60 coating designation; 18 gage, 0.048 inch thick.
 - 2. Manufacture curb bottom and mounting flanges for installation directly on roof deck, not on insulation; match slope and configuration of roof deck.
 - 3. Provide the layouts and configurations shown on the drawings.
- B. Curbs Adjacent to Roof Openings: Provide curb on all sides of opening, with top of curb horizontal for equipment mounting.
 - 1. Provide preservative treated wood nailers along top of curb.
 - 2. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.

3. Height Above Finished Roof Surface: 6 inches, minimum.
 4. Height Above Roof Deck: 14 inches, minimum.
- C. Equipment Rails: Two-sided curbs in straight lengths, with top horizontal for equipment mounting.
1. Provide preservative treated wood nailers along top of rails.
 2. Height Above Finished Roof Surface: 6 inches, minimum.
 3. Height Above Roof Deck: 14 inches, minimum.
- D. Pipe, Duct, and Conduit Mounting Pedestals: Vertical posts, minimum 8 inches square unless otherwise indicated.
1. Height Above Finished Roof Surface: 6 inches, minimum.
 2. Height Above Roof Deck: 14 inches, minimum.

2.02 ROOF HATCHES, MANUAL AND AUTOMATIC OPERATION

- A. Manufacturers - Smoke Vent Roof Hatches:
1. Bilco Company; Type DSH (double leaf): www.bilco.com.
 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Roof Hatches: Factory-assembled steel frame and cover, complete with operating and release hardware.
1. Style: Provide flat metal covers unless otherwise indicated.
 2. Mounting: Provide frames and curbs suitable for mounting conditions indicated on the drawings.
 3. Smoke Hatches: Where "smoke" or "smoke/heat" operation is indicated, provide the following additional features and omit manual operation for access:
 - a. Smoke Release Mechanism: Automatic opening on melting of replaceable UL-listed fusible link at 165 deg F.
 - b. UL-listed as automatically operated smoke and heat vent.
 - c. Fire Alarm Connection: Provide separate resettable electrical link release mechanism and connection point for fire alarm system.
 4. Size(s): As indicated on drawings; single-leaf style unless indicated as double-leaf.
 5. For Smoke Venting Without Access: 24 by 24 inches.
- C. Frames/Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
1. Material: Galvanized steel, 14 gage, 0.0747 inch thick.
 2. Finish: Factory prime paint.
 3. Insulation: 1 inch rigid glass fiber, located on outside face of curb.
- D. Metal Covers: Flush, insulated, hollow metal construction.
1. Capable of supporting 40 psf live load.
 2. Material: Galvanized steel; outer cover 14 gage, 0.0747 inch thick, liner 22 gage, 0.03 inch thick.
 3. Finish: Factory prime paint.
 4. Insulation: 1 inch rigid glass fiber.
 5. Gasket: Neoprene, continuous around cover perimeter.
- E. 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. Smoke Hatches: Manual release operation not to disturb automatic release mechanisms; easy resetting by Owner's maintenance personnel; provide latch designed to prevent relatching unless the automatic release mechanism has been properly reset for automatic operation.
7. Locking: Padlock hasp on interior.

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. 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 90 05
JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Sealants and joint backing.
- C. Precompressed foam sealers.

1.02 REFERENCE STANDARDS

- A. ASTM C834 - Standard Specification for Latex Sealants; 2010.
- B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2011.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2012.
- E. ASTM D1667 - Standard Specification for Flexible Cellular Materials--Poly(Vinyl Chloride) Foam (Closed-Cell); 2005 (Reapproved 2011).
- F. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with other sections referencing this section.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- C. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum 5 years experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years experience.

1.06 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.07 COORDINATION

- A. Coordinate the work with all sections referencing 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 Date of Substantial Completion.
- C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 SEALANTS

- A. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
- B. Type 1 - General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25, Uses M, G, and A; single or multi- component.
 - 1. Joint Movement Range: +/- 50 percent.
 - 2. Single component Product:
 - a. Sikaflex 15LM manufactured by Sika Corporation.
 - 3. Multi-component Product:
 - a. Dynatrol II manufactured by Pecora Corporation.
 - b. Sonolastic NP 2 manufactured by Sonneborn
 - 4. Applications: Use for:
 - a. Control, expansion, and soft joints in masonry.
 - b. Joints between concrete and other materials.
 - c. Joints between metal frames and other materials.
 - d. Other exterior joints for which no other sealant is indicated.
- C. Type 2 - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
 - 1. Color: Colors as selected.
 - 2. Applications: Use for:
 - a. Interior wall and ceiling control joints.
 - b. Joints between door and window frames and wall surfaces.
 - c. Other interior joints for which no other type of sealant is indicated.
- D. Type 3 - Coal tar extended, fuel resistant polyurethane sealant: Not Used.
- E. Type 4 - Fire Resistant Foam Sealant:
 - 1. Manufacturers:
 - a. Dow Corning: Product: 3-6548 RTV Foam.
- F. Type 5 - Exterior Expansion Joint Sealer: Factory-applied low-modulous silicone, acrylic-impregnated expanding foam sealant and closed-cell (EVA) foam combined in a unified, binary sealant system.
 - 1. Face color: As selected from standard range.
 - 2. Size as required to provide weathertight seal when installed.
 - 3. Product: Backerseal manufactured by Emseal.
 - 4. Applications: Use with top coat of Sealant Type 1 for:
 - a. Exterior wall expansion joints.
- G. Type 6 - Bathtub/Tile Sealant: White silicone; ASTM C920, Uses I, M and A; single component, mildew resistant.
 - 1. Applications: Use for:
 - a. Joints between plumbing fixtures and floor and wall surfaces.
 - b. Joints between kitchen and bath countertops and wall surfaces.
- H. Type 7 - Butyl Sealant: Not Used
- I. Type 8 - Acoustical Sealant: Butyl; ASTM C 920, Grade NS, Class 12-1/2, Uses M and A; single component, solvent release curing, non-skinning.
 - 1. Product: BA-98 manufactured by Pecora Corporation.
 - 2. Applications: Use for concealed locations only:

- a. Sealant bead between top stud runner and structure and between bottom stud track and floor.
- J. Type 9 - Fire Rated Wall Sealant: Exterior Expansion Joint Sealer: Factory-applied low-modulus silicone faced intumescent bellows, fire retardant-impregnated expanding foam sealant combined in a unified sealant system.
 1. Face color: As selected from standard range.
 2. Size as required to provide weathertight, fire-rated seal when installed.
 3. Rating: UL 2079, 2-hour.
 4. Product: WFR2 manufactured by Emseal.
 5. Application: Use for fire-rated expansion joints.

2.02 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; open cell polyurethane or reticulated (soft) polyethylene; oversized 33 to 50 percent larger than joint width; Denver Foam manufactured by Backer Rod Manufacturing, Inc.
- D. Fire Rated Joint Filler: Pre-engineered, patented, flexible, textile fiberglass roll material with a fiberglass matt facing, containing approximately 30 percent by weight unexpanded vermiculite; Ultra Block manufactured by Backer Rod Manufacturing, Inc.
- E. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces and joint openings are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Perform acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve the following:
 1. Width/depth ratio of 2:1.
 - a. Minimum joint depth: 1/4 inch; Maximum joint depth: 1/2 inch, unless otherwise required by manufacturer.
 2. Neck dimension no greater than 1/3 of the joint width.
 3. Surface bond area on each side not less than 75 percent of joint width.
- E. Install backer rod using blunt or rounded tool to a uniform (+/- 1/8 inch) depth without puncturing the material.

- F. Install bond breaker where joint backing is not used.
- G. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- H. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- I. Tool joints concave.

3.04 CLEANING

- A. Clean adjacent soiled surfaces.

3.05 PROTECTION

- A. Protect sealants until cured.

3.06 SCHEDULE

- A. Exterior Joints for Which No Other Sealant Type is Indicated: Type 1; colors as selected.
- B. Interior Joints for Which No Other Sealant is Indicated: Type 2; color as selected.
- C. Penetrations of Fire Rated Construction: Type 1 with Ultra Block joint filler or Type 4.
- D. Exterior Wall Expansion Joints: Type 5.
- E. Joints Between Plumbing Fixtures and Walls and Floors, and Between Countertops and Walls: Type 6.
- F. In STC-Rated Walls, Between Metal Stud Track/Runner and Adjacent Construction: Type 8.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Non-fire-rated steel doors and frames.
- C. Fire-rated steel doors and frames.
- D. Thermally insulated steel doors.
- E. Sound-rated steel doors and frames.

1.02 REFERENCE STANDARDS

- A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.
- B. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.
- C. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2011).
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.
- E. ASTM C1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus; 2011.
- F. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.
- G. ASTM E413 - Classification for Rating Sound Insulation; 2010.
- H. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.
- I. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2007.
- J. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2013.
- K. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.
- L. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.03 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 grade standard.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store in accordance with NAAMM HMMA 840.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Doors and Frames:

1. Assa Abloy Ceco, Curries, or Fleming: www.assaabloydss.com.
2. Republic Doors: www.republicdoor.com.
3. Steelcraft, an Ingersoll Rand brand: www.steelcraft.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOORS AND FRAMES

A. Requirements for All Doors and Frames:

1. Accessibility: Comply with ANSI/ICC A117.1.
2. Door Top Closures: Flush with top of faces and edges.
3. Door Edge Profile: Beveled on both edges.
4. Door Texture: Smooth faces.
5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
6. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
7. Galvanizing for Units in Wet Areas: All components hot-dipped zinc-iron alloy-coated (galvannealed), manufacturer's standard coating thickness.
8. Finish: Factory primed, for field finishing.

- #### **B. Combined Requirements:** If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all 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 STEEL DOORS

A. Exterior Doors :

1. Grade: ANSI A250.8 Level 4, physical performance Level A, Model 2, seamless.
2. Core: Polystyrene foam.
3. Top Closures for Outswinging Doors: Flush with top of faces and edges.
4. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
5. Insulating Value: U-value of 0.50, when tested in accordance with ASTM C1363.

B. Interior Doors, Non-Fire-Rated:

1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
2. Core: Cardboard honeycomb.
3. Thickness: 1-3/4 inches.

C. Interior Doors, Fire-Rated:

1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
2. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C ("positive pressure").
 - a. Rate of Temperature Rise Across Door Thickness : 250 F degrees.
 - b. Provide units listed and labeled by UL.
 - c. Attach fire rating label to each fire rated unit.

D. Interior Doors, Sound-Rated:

1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.

2. STC Rating of Assembled Door, Frame, and Seals: 35, calculated in accordance with ASTM E413, tested in accordance with ASTM E90.
3. Sound Seals: Integral, concealed in door or frame.
4. Force to Open and Close and Latch: Not more than 5 pounds.

2.04 STEEL FRAMES

A. General:

1. Comply with the requirements of grade specified for corresponding door.
2. Finish: Factory primed, for field finishing.
3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
4. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.
5. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
6. Provide kerfed stops for inserted weatherstripping.

B. Exterior Door Frames: Fully welded.

1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
2. Weatherstripping: Separate, see Section 08 71 00.

C. Interior Door Frames, Non-Fire-Rated: Fully welded and Knock-down types.

D. Interior Door Frames, Fire-Rated: Fully welded and Knock-down types.

1. Fire Rating: Same as door, labeled.

E. Sound-Rated Door Frames: Fully welded type.

2.05 FINISH MATERIALS

- A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

- A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.
- B. In addition, install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Coordinate installation of hardware.

3.04 TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.
- B. Adjust sound control doors so that seals are fully engaged when door is closed.
- C. Test sound control doors for force to close, latch, and unlatch; adjust as required to comply.

3.06 SCHEDULE

- A. Refer to Door and Frame Schedule on the drawings.
- B. New frames in existing openings shall be knock-down type.
- C. New frames in new openings shall be fully welded type.

END OF SECTION

SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 1000, 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.
- B. Flush wood doors; flush and flush glazed 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 08 80 00 - Glazing.

1.03 REFERENCE STANDARDS

- A. ASTM E413 - Classification for Rating Sound Insulation; 2010.
- B. ASTM E1408 - Standard Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems; 1991 (Reapproved 2000).
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.
- D. ICC (IBC) - International Building Code; 2012.
- E. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.
- F. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2013.
- G. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.
- H. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. 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.
 - 1. Provide the information required by AWI/AWMAC/WI Architectural Woodwork Standards.
- D. Specimen warranty.
- E. Test Reports: Show compliance with specified requirements for the following:
 - 1. Sound-retardant doors and frames; sealed panel tests are not acceptable.
- F. Samples: Submit two samples of door construction, 12 by 12 inch in size cut from top corner of door.
- G. Samples: Submit two samples of door veneer, 12 by 12 inch in size illustrating wood grain, stain color, and sheen.
- H. Manufacturer's Installation Instructions: Indicate special installation instructions.
- I. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

- A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of experience.
 - 1. A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body when FSC Certified wood is specified.
- C. Installed Fire Rated Door and Transom Panel Assembly: Conform to NFPA 80 for fire rated class as indicated.

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. 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 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Interior Doors: Provide manufacturer's warranty for the life of the 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.
 - 3. Marshfield DoorSystems, Inc: www.marshfielddoors.com.
 - 4. ABS Manufacturing .
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOORS AND PANELS

- A. All Doors: See drawings for locations and additional requirements.
 - 1. Quality Level: Premium Grade, in accordance with AWI/AWMAC/WI Architectural Woodwork Standards.
 - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at all locations .
 - 2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with International Building Code ("positive pressure"); UL or WH (ITS) labeled without any visible seals when door is open.
 - 3. Smoke and Draft Control Doors located in smoke partitions shown on the drawings: 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 w.g. pressure at both ambient and elevated temperatures; with "S" label; if necessary, provide additional gasketing or edge sealing.
 - 4. Sound Retardant Doors: Minimum STC of 35, calculated in accordance with ASTM E413, tested in accordance with ASTM E1408.

5. Select White Maple veneer facing with factory transparent finish as scheduled.

2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated above.
- B. Fire Rated Doors: Mineral core, Type FD, plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.
- C. Sound Retardant Doors: Equivalent to Type PC construction with core as required to achieve rating specified; plies and faces as indicated above.

2.04 DOOR FACINGS

- A. Wood Veneer Facing for Transparent Finish: Species as specified above, veneer grade as specified above, plain sliced, book veneer match, running assembly match; unless otherwise indicated.
 1. Vertical Edges: Same species as face veneer.
 2. Pairs: Pair match each pair; set match pairs within 10 feet of each other when doors are closed.
- B. Facing Adhesive: Type I - waterproof.

2.05 ACCESSORIES

- A. Glazing Stops: Wood, of same species as door facing, with metal clips at rated doors, mitered corners; prepared for countersink style tamper proof screws.
- B. Astragals for Fire Rated Double Doors: Steel, T shaped, overlapping and recessed at face edge, specifically for double doors.

2.06 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 and top of door for closer for hardware reinforcement.
- C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- E. Provide edge clearances in accordance with the quality standard specified.

2.07 FACTORY FINISHING - WOOD VENEER DOORS

- A. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5 - Finishing for Grade specified and as follows:
 1. Transparent:
 - a. System - 5, Varnish, Conversion.
 - b. Stain: As selected by Architect.
 - c. Sheen: Satin.
- B. Factory finish doors in accordance with approved sample.
- C. Seal door top edge with color sealer to match door facing.

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.
 - 1. Install fire-rated doors in accordance with NFPA 80 requirements.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.
- F. Install door louvers plumb and level.

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.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION

SECTION 08 33 00

SIDE COILING FIRE AND SMOKE RATED DOORS

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Provide all materials, labor, equipment and services necessary to furnish, deliver and install all work under this section as shown on the contract documents, specified herein, and as specified by the job conditions.

1.02 DESCRIPTION

- A. Related work specified elsewhere:
 - 1. Rough Carpentry. Section 06 10 00
 - 2. Access Panels & Doors: Section 08 31 00
 - 3. Painting: Section 09 91 00
 - 4. Electrical: Division 26

1.03 SUBMITTALS

- A. Procedures: Furnish submittals in accordance with the general requirements specified.
- B. Shop Drawing: Furnish shop drawings for architect's approval. Include elevations, sections, and details indicating dimensions, materials, finishes, conditions for anchorage and support of each door.
- C. Certifications:
 - 1. Submit manufacturer's Underwriters Laboratories (UL), Warnock Hersey (WH) or Factory Mutual Research (FM) laboratory test report verifying product compliance in accordance with the required fire and smoke ratings.
 - 2. Provide manufacturer's ICC Evaluation Service report confirming compliance of the fire door assembly in accordance with the requirements of the Building Code.
- D. Product Literature: Submit manufacturer's technical literature describing the product to be used under this section.
- E. Maintenance and Operating Manuals: Furnish complete manuals describing the materials, devices and procedures to be followed in operating and maintaining all doors under this section. Include manufacturer's brochures and parts lists describing the actual materials used in the product.

1.04 QUALITY ASSURANCE

- A. Fire & Smoke Rated Assemblies: Provide all doors with fire and smoke resistance rating required to comply with governing regulations which are inspected, tested, listed and labeled by UL, WH or FM and complying with NFPA 80 for class of opening. Provide units tested in accordance with the requirements of UL 10B, UL 1784, NFPA 252, ASTM E-152. Provide testing laboratory label permanently fastened to each fire and smoke door assembly.
- B. Regulatory Requirements:
 - 1. Comply with applicable requirements of the laws, codes, ordinances and regulations of federal, state and municipal authorities having jurisdiction.
 - 2. Listed by the ICC Evaluation Service in accordance with the applicable sections of the Building Code.

- C. Testing: Provide documentation from a certified testing agency that the fire door's self-closing governor mechanism and fire door operator have been tested for a minimum of 50,000 cycles and 500 self closing trip tests.
- D. Manufacturer Requirements: Door manufacturer shall have been in the business of and have experience in manufacturing the type of product covered under this specification section as well as giving credible service for a minimum of five (5) years. Provide list of at least ten (10) completed projects which include the products covered under this section.

1.05 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver and store materials in manufacturer's original packaging, labeled to show name, brand and type. Store materials in a protected dry location off the ground in accordance with manufacturer's instructions.

1.06 WARRANTY

- A. Door Warranty: Furnish one (1) year written warranty signed by the manufacturer and installer agreeing to repair or replace work which has failed as a result of defects in materials or workmanship. Upon notification within the warranty period, such defects shall be repaired at no cost to the owner.

PART 2 PRODUCTS

2.01 SIDE COILING FIRE & SMOKE RATED DOORS

- A. Manufacturer: Side coiling fire and smoke rated doors:
 - 1. Model S4000-PC as manufactured by McKeon Door Company.

2.02 MATERIALS

- A. General: Each unit shall consist of an interlocking slat curtain designed to travel in a horizontal plane, smoothly and without binding. Curtain shall be driven to the open and close position by a positive action sprocket drive, without the use of cables or counterbalance weights.
 - 1. Curtain: Shall be fabricated of galvanized, interlocking, steel slats with an approximate cross section not less than 3" wide by 7/8" deep.
- B. Leading Edge: Curtain shall be furnished with a structural steel member of tubular design to provide stiffness, limit deflection and provide for a tight fitting closure.
- C. Receiving Edge: Shall be fabricated of a steel member with sufficient depth, designed to accept the leading edge and form a tight fitting closure when the door is the fully closed position.
- D. Head Track: Shall be of not less than 1/8" thick steel and shall be provided with an integral locking bar. The faying surface shall not be less than 38% of the flat plate area when the door is in the closed position. Locking bar shall lock and retain the coiling curtain in place.
- E. Floor Track (Optional): Shall be no greater than 1½" deep and include integral removable stainless steel protective cover plates to allow for easy cleaning and proper maintenance.
- F. Perimeter Smoke Seals: Provide internal, fully concealed UL Classified smoke seals located within the head track and coil box assembly. Externally mounted smoke seals shall not be acceptable.
- G. Counterbalance Assemblies: The fire door shall be counterbalanced by means of adjustable steel helical torsion springs attached to shaft enclosed in pipe with required mounting blocks for attachment of curtain. Torsion springs shall be anchored to the same shaft and held in position by the same adjusting wheel accessible from outside the barrel assemblies.

- H. Coil Box: Shall be provided to entirely enclose coiled curtain and counterbalance assemblies. Coil box cover shall be of a rectangular design fabricated of 22 gauge galvanized sheet steel.
- I. Electric Motor Operator: Fire door shall be provided with a compact power unit designed and built by the door manufacturer. Operator shall be equipped with an adjustable screw-type limit switch to break the circuit at termination of travel. High efficiency planetary gearing running in an oil bath, shall be furnished together with a centrifugal governor, magnetic operated brake and a fail-safe magnetic release device, completely housed to protect against damage, dust and moisture. An efficient overload protection device, which will break the power circuit and protect against damage to the motor windings shall be integral with the unit. Operator is to be housed in a NEMA type 1 enclosure.
 - 1. Motor: Shall be intermediate duty, thermally protected, ball bearing type with a class A or better insulation. Horsepower of motor is to be 1/3hp minimum or of manufacturer's recommended size, which ever is greater.
 - 2. Starter: Shall be size "0" magnetic reversing starter, across the line type with mechanical and electrical interlocks, with 10 amp continuous rating and 24 volt control circuit.
 - 3. Reducer: Planetary gear type, 80% efficiency minimum.
 - 4. Brake: Magnetically activated, integral within the operator's housing.
 - 5. Control Station: Provide flush mount key switch control station marked open, close and stop.
- J. Self-Closing Mechanism: The fire door is to be designed with a centrifugal governor as an integral part of the operator's construction. The automatic release mechanism shall be activated by smoke detector or fire alarm. When activated the door is released and begins to close due to the captured torsion spring force. The speed of the door shall be governed by a centrifugal governor, designed to match the normal operating speed of the door, at a rate of not greater than 9" per second or less than 6" per second. The fire door shall self-close under its own power. Battery back-up systems to achieve self-closing are not acceptable.
- K. Magnetic Release with 10 Second Time Delay: A fail-safe magnetic release device shall be built into the operator as an integral part of the release mechanism. When power is interrupted to the release mechanism by the smoke detector or fire alarm, the door shall begin to self-close. In the event of power failure the time delay shall prevent the fire door from closing for a period of 10 seconds. Once the 10 seconds have lapsed, the fire door shall self-close without the aid of electricity or battery back-up systems. Once power has been restored the automatic reset time delay as well as the fire door shall reset themselves.
- L. Obstruction Sensing Device: The fire door shall be designed with a radio activated obstruction sensing safety edge. In the event that the safety edge meets an obstruction during the normal closing operation, the door shall stop, reverse and return to the open position. In the event the safety edge meets an obstruction during the self-closing operation, the door shall reverse and attempt to close three times. In the event that the obstruction has not been removed during the third attempt, the door shall come to rest on the obstruction and once the obstruction has been removed the fire door shall continue to the fully closed position.
- M. Easy Trip Test Feature: The fire door shall be designed so that it may be trip tested simply by cutting power to the operator. By turning the power switch off, the door shall self-close. Once the fire door has satisfactorily closed, it shall be reset simply by turning the power back on. No ladders or tools shall be needed to reset the door or the time delay unit.

- N. Finish: After completion of fabrication, clean all metal surfaces to remove dirt and chemically treat to provide for powder coat adhesion. Provide powder coat finish of color as selected by architect from manufacturer's standard RAL powder coat selection chart.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine surfaces and field conditions to which this work is to be performed and notify architect if conditions of surfaces exist which are detrimental to proper installation and timely completion of work.
- B. Verify all dimensions taken at job site affecting the work. Notify the architect in any instance where dimensions vary.
- C. Coordinate and schedule work under this section with work of other sections so as not to delay job progress.

3.02 INSTALLATION

- A. Perform installation using only factory approved and certified representatives of the door manufacturer.
- B. Install door assemblies at locations shown in perfect alignment and elevation, plumb, level, straight and true.
- C. Adjust door installation to provide uniform clearances and smooth non-binding operation.
- D. Install wiring in accordance with applicable local codes and the National Electrical Code Standard. Materials shall be UL listed.
- E. Test door closing sequence when activated by the building's fire alarm system. Reset door after successful test.

3.03 PROTECTION AND CLEANING

- A. Protect installed work using adequate and suitable means during and after installation until accepted by owner.
- B. Remove, repair or replace materials which have been damaged in any way.
- C. Clean surfaces of grime and dirt using acceptable and recommended means and methods.

END OF SECTION

SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1 - GENERAL

1.01 SUMMARY

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Section Includes:
 - 1. Smoke-control service doors.
 - 2. Smoke-control service doors with integral egress door.
 - 3. Insulated service doors.
 - 4. Fire-rated service doors.
- C. Related Sections:
 - 1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.
 - 2. Section 083333 "Coiling Counter Doors" for coiling counter doors.
 - 3. Section 083326 "Overhead Coiling Grilles" for open-curtain overhead coiling grilles.

1.02 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design overhead coiling doors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance, Exterior Doors: Exterior overhead coiling doors shall withstand the wind loads, the effects of gravity loads, and loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.
 - 1. Wind Loads:
 - a. Basic Wind Speed: 95 mph.
 - 2. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
- C. Operability under Wind Load: Design overhead coiling doors to remain operable under design wind load, acting inward and outward.
- D. Operation Cycles: Provide overhead coiling door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:
 - 1. Construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
 - 2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
 - 3. For fire-rated doors, description of fire-release system including testing and resetting instructions.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
 1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 1. Curtain Slats: 12 inches long.
- E. Delegated-Design Submittal: For overhead coiling doors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 1. Summary of forces and loads on walls and jambs.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and professional engineer.
- B. Oversize Construction Certification: For door assemblies required to be fire-rated and that exceed size limitations of labeled assemblies.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
 1. Obtain operators and controls from overhead coiling door manufacturer.
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.
 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
 3. Smoke Control: In corridors and smoke barriers, provide doors that are listed and labeled with the letter "S" on the fire-rating label by a qualified testing agency for smoke- and draft-control based on testing according to UL 1784; with maximum air-leakage rate of 3.0 cfm/sq. ft. of door opening at 0.10 inch wg for both ambient and elevated temperature tests.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.01 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
 - 1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 (Z275) zinc coating; nominal sheet thickness (coated) of 0.028 inch and as required to meet requirements.
 - 2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within slat faces.
 - 3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.
- B. Endlocks and Windlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.
- C. Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from manufacturer's standard hot-dip galvanized steel, stainless steel, or aluminum extrusions to match curtain slats and finish.
- D. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.02 HOOD

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
 - 1. Galvanized Steel: Nominal 0.028-inch-thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A 653/A 653M.

2.03 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 - 1. Lock Cylinders: Provide cylinders specified in Section 087100 "Door Hardware" and keyed to building keying system.
 - 2. Keys: Provide three for each cylinder.
- B. Chain Lock Keeper: Suitable for padlock.
- C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.04 CURTAIN ACCESSORIES

- A. Smoke Seals: Equip each fire-rated door with smoke-seal perimeter gaskets for smoke and draft control as required for door listing and labeling by a qualified testing agency.

- B. Weatherseals: Equip each exterior door with weather-stripping gaskets fitted to entire perimeter of door for a weathertight installation, unless otherwise indicated.
 - 1. At door head, use 1/8-inch- thick, replaceable, continuous sheet secured to inside of hood.
 - 2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- thick seals of flexible vinyl, rubber, or neoprene.
- C. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
- D. Automatic-Closing Device for Fire-Rated Doors: Equip each fire-rated door with an automatic-closing device that is inoperative during normal door operations and that has a governor unit complying with NFPA 80 and an easily tested and reset release mechanism designed to be activated by the following:
 - 1. Replaceable fusible links with temperature rise and melting point of 165 deg F interconnected and mounted on both sides of door opening.
 - 2. Manufacturer's standard UL-labeled smoke detector and door-holder-release devices.
 - 3. Manufacturer's standard UL-labeled heat detector and door-holder-release devices.
 - 4. Building fire-detection and -alarm systems and manufacturer's standard door-holder-release devices.

2.05 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.
- C. Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.06 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V, ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Operator location indicated for each door.

1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
- D. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 110513 "Common Motor Requirements for Equipment" unless otherwise indicated.
 1. Electrical Characteristics:
 - a. Phase: Single phase.
 - b. Volts: 115/230 V.
 - c. Hertz: 60.
 2. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.
 3. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
 4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 5. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.
 1. Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Self-Monitoring Type: Four-wire configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.
- G. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
 1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- K. Radio-Control System: Consisting of the following:
 1. Three-channel universal coaxial receiver to open, close, and stop door; one per operator.
 2. Remote-antenna mounting kit.

2.07 INSULATED DOOR ASSEMBLY

- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Overhead Door Corporation; 625 Series Insulated Service Door or comparable product by one of the following:
 - a. C.H.I. Overhead Doors.
 - b. Cookson Company.
 - c. Cornell Iron Works, Inc.
- B. Operation Cycles: Not less than 20,000.
 - 1. Include tamperproof cycle counter.
- C. Curtain R-Value: 7.7 deg F x h x sq. ft./Btu.
- D. Door Curtain Material: Galvanized steel.
- E. Door Curtain Slats: Flat profile slats of 2-5/8-inch center-to-center height.
 - 1. Insulated-Slat Interior Facing: Metal.
- F. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
- G. Hood: Match curtain material and finish.
 - 1. Shape: Round.
 - 2. Mounting: Face of wall.
- H. Locking Devices: Equip door with locking device assembly and chain lock keeper.
 - 1. Locking Device Assembly: Cremone type, both jamb sides locking bars, operable from inside and outside with cylinders.
- I. Electric Door Operator:
 - 1. Usage Classification: Medium duty, up to 15 cycles per hour.
 - 2. Operator Location: Top of hood.
 - 3. Motor Exposure: Interior.
 - 4. Emergency Manual Operation: Chain type.
 - 5. Obstruction-Detection Device: Automatic pneumatic sensor edge on bottom bar ; self-monitoring type.
 - a. Sensor Edge Bulb Color: Black.
 - 6. Remote-Control Station: Interior.
 - 7. Other Equipment: Radio-control system.
- J. Door Finish:
 - 1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
 - 2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.08 FIRE-RATED DOOR ASSEMBLY

- A. Fire-Rated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Overhead Door Corporation; 630 Series Fire-Rated Service Door or comparable product by one of the following:
 - a. C.H.I. Overhead Doors.
 - b. Cookson Company.
 - c. Cornell Iron Works, Inc.

- B. Operation Cycles: Not less than 20,000.
 - 1. Include tamperproof cycle counter.
- C. Fire rating: As indicated with temperature-rise limit and with smoke control.
- D. Door Curtain Material: Galvanized steel.
- E. Door Curtain Slats: Flat profile slats of 2-5/8-inch center-to-center height.
- F. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
- G. Hood: Match curtain material and finish.
 - 1. Shape: Round.
 - 2. Mounting: Face of wall.
- H. Locking Devices: Equip door with locking device assembly and chain lock keeper.
 - 1. Locking Device Assembly: Cremone type, both jamb sides locking bars, operable from inside and outside with cylinders.
- I. Electric Door Operator:
 - 1. Usage Classification: Medium duty, up to 15 cycles per hour.
 - 2. Operator Location: Top of hood.
 - 3. Motor Exposure: Interior.
 - 4. Emergency Manual Operation: Chain type.
 - 5. Obstruction-Detection Device: Automatic pneumatic sensor edge on bottom bar ; self-monitoring type.
 - a. Sensor Edge Bulb Color: Black.
 - 6. Remote-Control Station: Interior.
 - 7. Other Equipment: Radio-control system.
- J. Door Finish:
 - 1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.

2.09 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. 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.

2.10 STEEL AND GALVANIZED-STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- D. Fire-Rated Doors: Install according to NFPA 80.
- E. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.

3.03 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Perform installation and startup checks according to manufacturer's written instructions.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Test door closing when activated by detector or alarm-connected fire-release system. Reset door-closing mechanism after successful test.

3.04 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide weathertight fit around entire perimeter.

3.05 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION

SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 1000, 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.
- B. Aluminum-framed storefront, with vision glass and operable window.
- C. Perimeter sealant.

1.02 RELATED REQUIREMENTS

- A. Section 07 90 05 - Joint Sealers: Perimeter sealant and back-up materials.
- B. 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; American Architectural Manufacturers Association; 2012.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.
- C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting 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, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, 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. Design Data: Provide framing member structural and physical characteristics, dimensional limitations.
- E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

1.06 QUALITY ASSURANCE

- A. Manufacturer and Installer Qualifications: Company specializing in manufacturing aluminum glazing systems with minimum five years of experience.

1.07 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.

1.08 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.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide 10 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 STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Glazing Rabbet: For 1/4 inch monolithic glazing.
 - 2. Glazing Position: Centered (front to back).
 - 3. Vertical Mullion Dimensions: 1.75 x 4.5 inches.
 - 4. Finish: Pigmented organic coating.
 - 5. Basis of Design: Subject to compliance with requirements, provide Kawneer North America; TRIFAB 451 or comparable product by one of the following:
 - a. Other Acceptable Manufacturers:
 - 1) YKK AP America Inc.
 - 2) United States Aluminum Corp.

2.02 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Perimeter Sealant: Type 2 specified in Section 07 90 05.
- C. Glass: As specified in Section 08 80 00.

2.03 FINISHES

2.04 FABRICATION

- A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline.
- C. Prepare components to receive anchor devices. Fabricate anchors.
- D. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
- E. Arrange fasteners and attachments to conceal from view.
- F. Reinforce framing members for imposed loads.
- G. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
 - 1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

PART 3 EXECUTION

3.01 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. Set thresholds in bed of mastic and secure.
- G. Install glass and infill panels in accordance with Section 08 80 00, using glazing method required to achieve performance criteria.
- H. Install perimeter sealant in accordance with Section 07 90 05.
- I. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.02 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for independent testing and inspection requirements. Inspection will monitor quality of installation and glazing.

3.04 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. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by method acceptable to sealant manufacturer.

3.05 PROTECTION

- A. Protect installed products from damage during subsequent construction.

END OF SECTION

SECTION 08 71 01
DOOR HARDWARE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Work under this section comprises of furnishing and installing commercial door hardware needed for a complete and operational system for following:
 - a. Swinging doors

PART 2 PRODUCTS

2.01 MATERIALS

A. General Requirements:

1. Hardware shall be of best grade, entirely free of imperfections in manufacture and finish, and shall satisfactorily perform various functions needed.
2. Furnish necessary screws, bolts or others fastenings of suitable size and type to anchor hardware in position and match hardware as to material and finish. Provide Phillips flat-head screws except as otherwise indicated.
3. Do not use through-bolts for installations where bolt head or nut opposite face is exposed in other work. Use of sex bolts shall not be allowed.
4. Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as indicated. Items of hardware not definitely specified, but needed for satisfactory installation of hardware shall be provided. Such items shall be of type and quality suitable for service needed and comparable to adjacent hardware.
5. Finishes shall comply with ANSI A156.18/ BHMA 1301. Finish designations cross references shall be as follows:

BHMA Code	Description	Nearest US Equiv.	BHMA Category	Basis Metal
600	Primed for painting	USP	D	Steel
626	Satin chromium plated	US26D	A	Brass; Bronze
628	Satin aluminum, clear anodized	US27	A	Aluminum
630	Satin stainless steel	US32D	A	Stainless Steel
652	Satin chromium plated	US26D	E	Steel
689	Aluminum painted	US28	E	Any

B. SUBSTITUTIONS:

1. Manufacturers and model numbers listed are to establish a standard of quality and design. The architect must approve all product substitutions. Any request for substitutions must be submitted 10 days before the bid date, to allow sufficient time for an addendum to be added to the bid document. In accordance with Section 016000, required data and physical samples must be provided to the architect for review.

2.02 HINGES

A. Butt Hinges: ANSI/ BHMA A156.1

1. Provide full mortise, template, 5-knuckle, button tip hinges with non-rising loose pins and ball type bearings.
2. Out-swinging exterior doors shall be furnished with solid bronze or stainless steel, hinges with non-removable pins or security studs.
3. Interior doors with locksets shall be furnished with non-removable pins hinges.
4. Hinges shall be furnished in following quantities:

- a. Doors up to 90" in height: 3 hinges
- b. Doors over 90" in height: Add 1 hinge for every additional 30"
5. Furnish hinge sizes not less than as follows:
 - a. For 1 3/4" Thick Doors: Standard weight
 - 1) Doors up to 3'-0" wide: 4 1/2 x 4 1/2 x 0.134 gauge
 - 2) Doors 3'-0" to 4'-0" wide: 5 x 4 1/2 x 0.146 gauge
 - 3) Doors over 4'-0" wide: 6 x 4 1/2 x 0.160 gauge
 - b. For 1 3/4" Thick Doors: Heavy weight
 - 1) Doors up to 3'-0" wide: 4 1/2 x 4 1/2 x 0.180 gauge
 - 2) Doors 3'-0" to 4'-0" wide: 5 x 4 1/2 x 0.190 gauge
 - 3) Doors over 4'-0" wide: 6 x 4 1/2 x 0.203 gauge
6. Furnish hinges of sufficient throw where needed to clear trim or permit doors to swing 180 degrees.
7. Finishes:
 - a. Exterior Doors: BHMA #630 (US32D)
 - b. Interior Doors: BHMA #652 (US26D)
8. Acceptable Manufacturers:
 - a. Bommer
 - b. Hager
 - c. Mckinney

2.03 LOCKSETS AND LATCHSETS

A. General Requirements:

1. Shape of lever shall be easy to grasp with one hand and not require tight grasping, tight pinching, or twisting of wrist.
2. Locksets and latchsets shall not require more than 15 lbf to release latch. Locks shall not require use of a key, tool, or special knowledge for operation.
3. Provide manufacturer's standard wrought box strike for each latchset and lockset with curved lip extended to protect frame without catching clothing. Finish shall match hardware set.
4. Locks and cylinders shall be provided with small format figure eight housing to accept Best interchangeable cores. Lock cylinder parts shall be made from brass/bronze, stainless steel, or nickel silver.

B. Mortise Locksets and Latchsets:

1. Provide heavy duty mortise locksets and latchsets that comply to ANSI A156.13, Series 1000, Grade 1 Operational. Functions as listed in Hardware Sets.
2. Locksets shall be manufactured from heavy gauge steel, 1/8" minimum lockcase thickness, containing components of steel with a zinc dichromate plating for corrosion resistance.
3. Locksets are to have a standard 2 3/4" backset with a full 3/4" throw. Deadbolt shall be a full 1" throw, constructed of stainless steel.
4. Lock shall be easily handed without opening the lock case.
5. Lock trim shall be through-bolted to door to assure correct alignment a proper operation.
6. Finish: BHMA #626 (US26D)
7. Acceptable Manufacturers:
 - a. Best Lock: 45H Series with 15H lever design
 - b. Schlage: L Series with 06A lever design
 - c. Other substitutions not allowed

2.04 DOOR CLOSERS

A. General Requirements:

1. Closers shall be sealed and filled with all-weather fluid. Provide stable hydraulic fluid to withstand a temperature range of 120 degrees F to minus 30 degrees F.

B. Surface Closers: ANSI/ BHMA A156.4, Grade 1

1. Surface mounted closers shall be full rack-and-pinion type with cast iron body. Double heat-treated shaft, full complement bearings, single piece forged piston, chrome silicon steel spring, non-critical screw valves; back check, sweep and latch.
2. Closer spindle journal size to be a minimum 3/4" diameter
3. Bearing size to be minimum 5/8" wide
4. Furnish closers complete with rectangular, non-ferrous covers, necessary brackets and fasteners for top of door surface mounted units.
5. Closer products with any type of pressure relief valve system shall not be acceptable.
6. Closers shall be ISO 9000 certified. Units shall be stamped with date of manufacturer code.
7. Non-sized closer to be independent lab tested for 10,000,000 cycles.
8. Closers shall be non-sized, field adjustable from size 1 to 6.
9. Furnish non-sized closers with 1 1/2" diameter piston.
10. Do not through-bolt if there has been special blocking specified in wood door specification; refer to Section 08210.
11. Locate closers on interior side of exterior doors and on non-public side of interior doors, unless otherwise specified.
12. Provide extra-duty arms (EDA) at doors scheduled with parallel arm applications.
13. Provide plates, brackets and special templates when needed for interface with particular header door and wall conditions and adjacent hardware.
14. Closers shall be tested to 100 hours of salt spray test in compliance with ASTM B117; furnish data on request.
15. Finish: BMHA #628 Powder-coated aluminum finish
16. Acceptable Manufacturers:
 - a. LCN: 4040XP Series (where specified in hardware sets)
 - b. Substitutions not allowed

2.05 OVERHEAD STOPS AND HOLDERS

A. Surface Mounted Heavy Duty Overhead Holders/Stops: ANSI/ BHMA A156.8

1. Description: Heavy-duty extruded brass, bronze or stainless steel stop/holders with shock absorber and no plastic parts
2. Finish: BHMA #630 (US32D)
3. Acceptable Manufacturers:
 - a. GJ: 90 Series
 - b. No Substitution permitted

2.06 SEALS AND GASKETS

A. General Requirements: ANSI/ BHMA A156.21

1. Except as otherwise indicated provide weather-stripping and sweeps of type, size and profile as shown or scheduled.
2. Metal: Extruded aluminum; 6063-T5 alloy
 - a. Finish: Aluminum anodized; BHMA #628 (US28)
3. Acceptable Manufacturers:
 - a. National Guard
 - b. Pemko

- c. Reese

2.07 THRESHOLDS

A. General Requirements: ANSI/ BHMA A156.21

1. Except as otherwise indicated provide standard threshold units of type, size and profile as shown or scheduled.
2. Metal: Extruded aluminum; 6063-T5 alloy
 - a. Finish: Clear anodized; BHMA #628 (US28)
3. Provide thresholds with vinyl foot seals.
4. Acceptable Manufacturers:
 - a. National Guard
 - b. Pemko
 - c. Reese

2.08 CYLINDERS, KEYING SYSTEMS AND KEY CONTROL

A. General Requirements:

- B. Provide temporary construction keying system during construction period. Permanent keys shall be furnished to Owner's Representative prior to occupancy. Owner or Owner's Security Agent will void operation of construction keys.

C. Permanent keyed lock cores:

1. Permanent lock cores to match existing manufacturer and keyway.

D. Key Material:

1. Provide manufacturer's standard embossed keys of nickel silver to ensure durability.
Key Quantity: Furnish keys in following quantities:
 - a. Master Keys: 6 per master group
 - b. Key Blanks: 3 per cylinder
 - c. Temporary Construction Master Keys: 12 total
2. Deliver end user exclusive permanent key blanks and other security keys directly to Owner's representative from manufacturer by secure courier, return receipt requested. Failure to properly comply with these requirements shall be cause for replacement of cylinders and keys involved at no additional cost to Owner.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions:

1. Examine doors and frames with Installer present for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
2. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
3. Proceed with installation only after unsatisfactory conditions have been corrected.
4. Commencement of installation constitutes acceptance of conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Surface Preparation:

1. Steel Doors and Frames: Comply with DHI A115 Series
 - a. Surface-Applied Door Hardware: Drill and tap doors and frames in compliance with SDI 109

3.03 INSTALLATION

A. General Requirements:

1. Install each door hardware item to comply with manufacturers' written instructions using manufacturer's supplied fasteners.
2. Securely install finish hardware items in compliance with accepted schedule and templates furnished with hardware.
3. Install mortised items flush with adjacent surfaces.
4. Install locksets, surface mounted closers, and trim after finishing of doors and frames is complete.
 - a. Where cutting and fitting is needed to install door hardware onto or into surfaces that are to be painted or finished in another way later, coordinate removal, storage, and reinstallation of door hardware with finishing work.
5. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
6. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in compliance with industry standards.

B. Mounting Heights:

1. Mount door hardware units at heights indicated in following applicable publications, unless otherwise specifically indicated or required to comply with governing regulations:
 - a. Steel Doors and Frames: ANSI A250.6
 - 1) DHI Publication Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames
 - 2) DHI Publication Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames

C. Door Closers:

1. Mount all door closers parallel arm as per university standard unless otherwise noted in hardware sets. All door closers are to be thru-bolted.

D. Thresholds:

1. Set thresholds for exterior and acoustical doors in full bed of sealant in compliance with requirements specified in Division 7.

3.04 ADJUSTING

A. Initial Adjustment:

1. 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.
2. Adjust door closer sweep period so that from an open position of 70 degrees door will take at least 3 seconds to move to a point 3" from latch measured to leading edge of door.

B. Final Adjustment:

1. Return to Project during week prior to Substantial Completion and make final check and adjustment of hardware items.
2. Adjust hardware so doors operate in perfect order. Test and adjust hardware for quiet, smooth operation, free of sticking, binding, or rattling. Adjust closers for proper, smooth operation.
3. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Six Month Adjustment:

1. Approximately six months after Date of Substantial Completion, installer shall perform following:
 - a. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
 - b. Consult with, and instruct, Owner's personnel on recommended maintenance procedures.
 - c. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation.

3.05 CLEANING

- A. Exposed hardware shall be carefully cleaned by methods not injurious to finish, immediately preceding occupancy. Replace defective, damaged, or missing hardware.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Clean operating items as needed to restore proper function and finish.

3.06 PROTECTION

- A. Provide final protection and maintain conditions that ensure door hardware shall be without damage or deterioration at time of Substantial Completion.
- B. Protect door hardware items from abuse, corrosion and other damage until Owner accepts Project as complete.

3.07 DOOR HARDWARE SCHEDULE

A. General Requirements:

1. To define requirements for materials, size, and design specific products manufactured by certain manufacturers are indicated in door hardware sets. Materials specified herein are cited as minimum standard of quality that will be acceptable and shall not preclude consideration of equivalent or superior materials. Equivalent products by other acceptable manufacturers specified above may be provided.
 - a. Door hardware sets provide quantity, item, size, finish or color indicated and named manufacturer's product.
 - b. Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. Hardware Sets: List of manufacturers represented in the hardware sets:

1. Hinges:Hager - www.hager.com (HAG)
2. Locksets & Latchsets:Schlage - www.schlage.com (SCH)
3. Surface Closers:LCN - www.lcnclousers.com (LCN)
4. Overhead Stops:Glyn-Johnson - www.glynn-johnson.com (GJH)
5. Thresholds:National Guard - www.ngp.com (NGP)
6. Weatherstrip & Gasket:National Guard - www.ngp.com (NGP)

C. HW SET 001

DOOR NO. 100 (PAIR - HMD X HMF)

3	EA	HINGE	BB1199 4.5 X 4.5 NRP	630	HAG
1	EA	STOREROOM LOCK	LV9480BDC 06A	630	SCH
1	EA	PERMANENT CORE	(MATCH EXISTING & KEYWAY)	626	
1	EA	SURFACR CLOSER	4040XP-3049EDA	689	LCN
1	EA	OVERHEAD STOP	90S	630	GLY

1	SET	PERIMETER SEAL	9002A	628	NGP
1	EA	DRIP GUARD	16A	628	NGP

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Glass.
- C. Glazing compounds and accessories.

1.02 REFERENCE STANDARDS

- A. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).
- B. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass; 2012.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- C. Manufacturer's Certificate: Certify that Type 1 and Type 2 glass meets or exceeds specified requirements.

1.04 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

PART 2 PRODUCTS

2.01 GLASS MATERIALS

- A. Float Glass Manufacturers:
 - 1. AGC Flat Glass North America, Inc: www.na.agc-flatglass.com.
 - 2. Guardian Industries Corp: www.sunguardglass.com.
 - 3. Pilkington North America Inc: www.pilkington.com/na.
 - 4. PPG Industries, Inc: www.ppgideascales.com.
 - 5. Substitutions: Refer to Section 01 60 00 - Product Requirements.
- B. Float Glass: All glazing is to be float glass unless otherwise indicated.
 - 1. Fully Tempered Types: ASTM C1048.
 - 2. Thickness: 1/4 inch.
- C. Fire-Protection-Rated Glazing:
 - 1. IBC Fire Protection Rating: D-H-45 or OH-45 or W-60, minimum.
 - 2. Provide products listed by Underwriters Laboratories or Intertek Warnock Hersey.
 - 3. Products:
 - a. SCHOTT North America Inc; Pyran Platinum L (laminated) Fire Rated Ceramic Glass.
 - b. Vetrotech Saint-Gobain North America; .

2.02 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Glazing Tape: Preformed butyl compound ; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.
 - 1. Manufacturers:
 - a. Pecora Corporation: www.pecora.com.
 - b. Tremco Global Sealants: www.tremcosealants.com.
 - c. Substitutions: Refer to Section 01 60 00 - Product Requirements.
- C. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option I; black color.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Install sealant in accordance with manufacturer's instructions.

3.03 GLAZING METHODS

3.04 INSTALLATION - INTERIOR DRY METHOD (TAPE AND TAPE)

- A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
- C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
- D. Place glazing tape on free perimeter of glazing in same manner described above.
- E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- F. Knife trim protruding tape.

3.05 CLEANING

- A. Remove glazing materials from finish surfaces.
- B. Remove labels after Work is complete.
- C. Clean glass and adjacent surfaces.

END OF SECTION

SECTION 08 83 00

MIRRORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Glass mirrors.

1.02 REFERENCE STANDARDS

- A. ASTM C1036 - Standard Specification for Flat Glass; 2011e1.
- B. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008.
- C. GANA (GM) - GANA Glazing Manual; Glass Association of North America; 2009.
- D. GANA (TIPS) - Mirrors Handle with Extreme Care: Tips For the Professional on the Care and Handling of Mirrors; National Association of Mirror Manufacturers; 2004 (<http://www.mirrorlink.org/members/technical.h>)

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data on Mirror Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- D. Samples: Submit two sheet mirror samples, 12 x 12 inch in size, illustrating mirrors, coloration.
- E. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.
- F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual for glazing installation methods.
- B. Fabricate, store, transport, receive, install, and clean mirrors in accordance with recommendations of GANA (TIPS) "Mirrors Handle with Extreme Care: Tips For the Professional on the Care and Handling of Mirrors."

1.05 FIELD CONDITIONS

- A. Do not install mirrors when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Mirrors:

1. Binswanger Mirror/ACI Distribution: www.binswangerglass.com.
2. Lenoir Mirror Co: www.lenoirmirror.com.
3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

- A. Mirror Glass - General: Select materials and/or provide supports as required to limit mirrored glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.
- B. Mirror Glass : ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality Q1 (mirror select); silvering, protective coating and physical characteristics complying with ASTM C1503; 1/4 inch minimum thick.
 1. Sizes noted on Drawings.
 2. Shatter-Resistance: Tempered or laminated glass or scrim backing to meet safety glazing.
 3. Edge Treatment: Flat polished.

2.03 GLAZING ACCESSORIES

- A. Mirror Adhesive: Chemically compatible with mirror coating and wall substrate.
 1. Product: Mirro-Mastic as manufactured by Palmer Products.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Install mirrors in accordance with GANA recommendations.
- B. Set mirrors plumb and level, free of optical distortion.
- C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.
- D. Frameless Mirrors: Set mirrors with adhesive, applied in accordance with adhesive manufacturer's instructions.

3.02 CLEANING

- A. Remove wet glazing materials from finish surfaces.
- B. Remove labels after work is complete.
- C. Clean mirrors and adjacent surfaces.

3.03 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

SECTION 08 92 00

LOUVERED EQUIPMENT ENCLOSURES

PART 2 PRODUCTS

1.01 ROOFTOP EQUIPMENT SCREENS - GENERAL

END OF SECTION

SECTION 09 05 61

COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. This section applies to all floors identified in the contract documents as to receive the following types of floor coverings:
 - 1. Resilient tile and sheet.
- C. Preparation of new concrete floor slabs for installation of floor coverings.
- D. Testing of concrete floor slabs for moisture and pH.
- E. Remediation of concrete floor slabs due to unsatisfactory moisture or 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.

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. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
 - 3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
- B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.
- C. 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 pH found, and suitable for adhesion of flooring without further treatment.
 - 1. Thickness: 1/8 inch, maximum.
 - 2. If testing agency recommends any particular products, use one of those.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

- A. Perform following operations in the order indicated:
 - 1. Preliminary cleaning.
 - 2. 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.

3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 4. pH tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 5. Specified remediation, if required.
 6. Patching, smoothing, and leveling, as required.
 7. Other preparation specified.
 8. Adhesive bond and compatibility test.
 9. 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 over entire suspect floor area.
 3. Excessive 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 and as follows.

- D. 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.
- 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 any test value exceeds 75 percent relative humidity.
- F. Report: Report the information required by the test method.

3.05 PH 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. Note: This procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
- C. Use a wide range pH paper, its associated chart, and distilled or deionized water.
- D. 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 pH paper into the water, remove it, and compare immediately to chart to determine pH reading.
- 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 any 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. Do not fill expansion joints, isolation joints, or other moving joints.

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

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 1000, 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.
- B. Performance criteria for gypsum board assemblies.
- C. Metal stud wall framing.
- D. Metal channel ceiling panel framing.
- E. Gypsum wallboard.
- F. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 09 51 00 - Acoustical Ceilings: Acoustically Reflective Ceiling Panels

1.03 REFERENCE STANDARDS

- A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2002 (Reapproved 2007).
- B. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2011a.
- C. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2011.
- D. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2011.
- E. 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; 2011.
- F. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2007.
- G. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2010a.
- H. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2011.
- I. ASTM C1629/C1629 - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2006.
- J. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.
- K. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.
- L. ASTM E413 - Classification for Rating Sound Insulation; 2010.
- M. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association; 2010.
- N. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- D. Test Reports: For all stud framing products that do not comply with ASTM C645 or C 754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board application and finishing.
- B. Copies of Documents at Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
 - 1. See PART 3 for finishing requirements.
- B. Interior Partitions Indicated as Acoustic: Provide completed assemblies with the following characteristics:
 - 1. Acoustic Attenuation: STC as indicated calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:
 - 1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL Fire Resistance Directory. Refer to Drawings for UL Assembly Reference Numbers.

2.02 METAL FRAMING MATERIALS

- A. Manufacturers - Metal Framing, Connectors, and Accessories:
 - 1. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com.
 - 2. Marino: www.marinoware.com.
 - 3. Phillips Manufacturing Company: www.phillipsmfg.com.
- B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/360 at 7.5 psf.
 - 1. Exception: The minimum metal thickness and section properties requirements of ASTM C 645 are waived provided steel of 40 ksi minimum yield strength is used, the metal is continuously dimpled, the effective thickness is at least twice the base metal thickness, and maximum stud heights are determined by testing in accordance with ASTM E 72 using assemblies specified by ASTM C 754.
 - 2. Studs: "C" shaped with flat or formed webs 20 gage minimum.
 - 3. Runners: U shaped, sized to match studs.
 - 4. Ceiling Channels: C shaped.
 - 5. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
- C. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
- D. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and braced with continuous bridging both sides.

2.03 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 - 1. CertainTeed Corporation: www.certainteed.com.
 - 2. Georgia-Pacific Gypsum: www.gpgypsum.com.
 - 3. Lafarge North America Inc: www.lafargenorthamerica.com.
 - 4. National Gypsum Company: www.nationalgypsum.com.
 - 5. USG Corporation: www.usg.com.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold-resistant board is required at all locations.
 - 3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - 4. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.
 - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
- C. Impact-Rated Wallboard: Tested to Level 3 soft-body and hard-body impact in accordance with ASTM C 1629.
 - 1. Application: Up to 8 feet above finish floor in areas scheduled to receive gypsum board.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 3. Paper-Faced Type: Gypsum wallboard as defined in ASTM C1396/C1396M.
 - 4. Type: Fire-resistance rated Type X, UL or WH listed.
 - 5. Thickness: 5/8 inch
 - 6. Edges: Tapered.
 - 7. Products:
 - a. National Gypsum Company; Gold Bond Hi-Impact Brand XP Wallboard.
 - b. Temple-Inland Inc; ComfortGuard IR Impact Resistant.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

- A. Finishing Accessories: ASTM C1047, galvanized steel, rolled zinc, or rigid plastic, unless otherwise indicated.
 - 1. Types: As detailed or required for finished appearance.
 - 2. Special Shapes: In addition to conventional cornerbead and control joints, provide L-bead at exposed panel edges.
- B. Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.
 - 1. Tape: 2 inch wide, coated glass fiber tape for joints and corners in wet areas.
 - 2. Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
 - 3. Powder-type vinyl-based joint compound.
- C. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.

- D. Screws for Attachment to Steel Members Less Than 0.03 inch In Thickness, to Wood Members, and to Gypsum Board: ASTM C1002; self-piercing tapping type; cadmium-plated for exterior locations.
- E. Screws for Attachment to Steel Members From 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws for application of gypsum board to loadbearing steel studs.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
 - 1. Level ceiling system to a tolerance of 1/1200.
 - 2. Laterally brace entire suspension system.
 - 3. Install bracing as required at exterior locations to resist wind uplift.
- C. Studs: Space studs as indicated.
 - 1. Extend partition framing to structure in typical conditions, 6 inches above ceiling at perimeter wall conditions and as indicated.
 - 2. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
- D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

3.03 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.

3.04 BOARD INSTALLATION

- A. Comply with ASTM C 840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

3.06 JOINT TREATMENT

- A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 5: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 2. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

- B. 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.
- C. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

END OF SECTION

SECTION 09 30 00

TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Tile for floor applications.
- C. Solid surface thresholds.
- D. Trim.

1.02 REFERENCE STANDARDS

- A. ANSI A108 Series/A118 Series/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2012.1.
- B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2012.1.
- C. 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; 2012.1.
- D. 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
- E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2012.1.
- F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 2012.1.
- G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 2012.1.
- H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 2012.1.
- I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 2012.1.
- J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2012.1.
- K. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; 2012.1.
- L. ANSI A118.4 - American National Standard Specifications for Latex-Portland Cement Mortar; 2012.1.
- M. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2012.
- N. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2012.

1.03 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. Samples: Mount tile and apply grout on two plywood panels, minimum 24 x24 inches in size illustrating pattern, color variations, and grout joint size variations.
- D. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.
- E. LEED Submittal: Documentation of recycled content and location of manufacture.

1.04 QUALITY ASSURANCE

- A. Maintain one copy of The Tile Council of North America Handbook and ANSI A108 Series/A118 Series on site.
- B. Installer Qualifications: Company specializing in performing tile installation, with minimum of 5 years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.06 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. Dal-Tile Corporation: www.daltile.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Paver and Wall Tile : ANSI A137.1, and as follows:
 - 1. Continental Slate manufactured by Daltile or approved equivalent product.
 - 2. Size and Shape: 18 x 18 inch for floor installation.
 - 3. Thickness: 5/16 inch
 - 4. Face: Plain.
 - 5. Surface Finish: Unglazed.
 - 6. Floor Pattern: As shown.
 - 7. Colors: As scheduled.
 - 8. Trim Units: Matching bullnose and cove base shapes in sizes coordinated with field tile.

2.02 TRIM AND ACCESSORIES

- A. Trim: Porcelian, style and dimensions to match field tile, for setting using tile mortar or adhesive.
 - 1. Applications: Use in the following locations:
 - a. Open edges of wall tile: Bullnose
 - b. Wall corners, inside: Jointed.
 - c. Floor to wall joints: Cove base.
 - 2. Manufacturer: Same as field tile.
- B. Thresholds: Solid surface material, color as scheduled, honed finish; 4 inches wide by full width of wall or frame opening; 3/4 inch thick; profile as detailed with radiused corners on top side; without holes, cracks, or open seams
 - 1. Material: Solid surface: Grade B or C.
 - 2. Applications: Provide at the following locations:

- a. At doorways where tile terminates.
- b. At open edges of floor tile where adjacent finish is a different height.

2.03 SETTING MATERIALS

- A. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
1. Application(s): Use this type of bond coat where indicated and where no other type of bond coat is indicated.
 2. Products:
 - a. Custom Building Products; MegaLite: www.custombuildingproducts.com.
 - b. LATICRETE International, Inc; LATICRETE 254 Platinum: www.laticrete.com.
 - c. Merkrete, by Parex USA, Inc; Merkrete 720 Marble Pro: www.merkrete.com.
 - d. ProSpec, an Oldcastle brand; Permalastic System: www.prospec.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 MORTAR MATERIALS

- A. Mortar Bond Coat Materials for Thin-Set Installations:
1. Latex-Portland Cement type: ANSI A118.4.

2.05 GROUTS

- A. Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
 2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
 3. Color(s): As selected by Architect from manufacturer's full line.
- B. Grout Sealant: Manufacturer's standard product for sealing grout joints that does not change color or appearance of grout.
1. Products:
 - a. Bonsal, W. R., Company; Grout Sealer.
 - b. Bostik; CeramaSeal Grout Sealer.
 - c. C-Cure; Penetrating Sealer 978.
 - d. MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout.
 - e. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
 - f. TEC Specialty Products Inc.; TA-256 Penetrating Silicone Grout Sealer."

2.06 MEDIUM-BED MATERIALS

- A. Cementitious self-leveling underlayment:
1. Polymer-modified, self-leveling Portland cement-based underlayment.
 2. Product: Ardex TL 1000 manufactured by ARDEX Americas, 400 Ardex Park Drive, Aliquippa, Pennsylvania 15001
 3. Primer: Ardex P51.
 4. Cementitious bond coat: ANSI A118.6 or better.
 5. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
 - a. Thickness: 20 mils, maximum.
 - b. Crack Resistance: No failure at 1/16 inch gap, minimum.
 - c. Providing compliance with performance requirements and manufacturer's installation requirements, the following trowel applied crack prevention membrane is approved:

- 1) RedGard Waterproofing and Crack Prevention Membrane manufactured by Custom Building Products.
- 2) LATICRETE International, Inc; LATICRETE Blue 92 Anti-Fracture Membrane: www.laticrete.com.
- 3) Merkrete, by Parex USA, Inc.; Merkrete Fracture Guard 5000: www.merkrete.com.

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.

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.
- K. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with The Tile Council of North America Handbook Method F205A, Above-ground Concrete with cementitious Self-leveling underlayment and Ceramic Tile grout, unless otherwise indicated.
 1. Use uncoupling membrane under all tile unless other underlayment is indicated.

3.05 GROUTING

- A. Follow grout manufacturer's recommendations as to grouting procedures and precautions.
- B. Remove all grout haze, observing both tile and grout manufacturer's recommendations as to use of acid and chemical cleaners.
- C. Rinse tile work thoroughly with clean water before and after chemical cleaners.
- D. Polish surface of tile work with soft cloth.

3.06 PROTECTION, CLEANING AND GROUT SEALING

- A. Do not permit traffic over finished floor surface for 4 days after installation.
- B. Apply to clean, completed tile walls and floors a protective coat of neutral cleaner solution, 1 part cleaner to 1 part water.
- C. Cover tile floors with heavy-duty, non-staining construction paper, masked in place.
- D. Prior to final acceptance of tile work, remove paper and rinse protective coat of neutral cleaner from all the surfaces.
- E. Clean tile and grout surfaces.
- F. Apply grout sealant according to manufacturer's directions.

END OF SECTION

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Suspended metal grid ceiling system.
- C. Acoustical units.
- D. Concealed wire-hung suspension system.

1.02 RELATED REQUIREMENTS

- A. Section 09 21 16 - Gypsum Board Assemblies: Reflective ceiling panel material.

1.03 REFERENCE STANDARDS

- A. ASTM C635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2007.
- B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 2008.
- C. 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; 2011.
- D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2008e1.

1.04 ADMINISTRATIVE REQUIREMENTS

- 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. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- 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, acoustical units, and special ceiling panels.
- D. Samples: Submit two samples 6 x 6 inch in size illustrating material and finish of acoustical units.
- E. Samples: Submit two samples each, 6 inches long, of suspension system main runner, cross runner, and perimeter molding.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.06 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.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS

- A. Manufacturers:

1. Armstrong World Industries, Inc: www.armstrong.com.
 2. CertainTeed Corporation: www.certainteed.com.
 3. USG: www.usg.com.
 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Acoustical Panels Type ACP-1: Painted mineral fiber, ASTM E1264, Type IV with the following characteristics:
1. Size: 24 x 24 inches.
 2. Thickness: 3/4 inches.
 3. Composition: Wet felted.
 4. NRC Range: 0.70 as specified in ASTM E1264.
 5. Ceiling Attenuation Class (CAC): 35, determined as specified in ASTM E1264.
 6. Edge: Square.
 7. Surface Color: White.
 8. Surface Pattern: Non-directional fissured.
 9. Product: Ultima by Armstrong.
 10. Suspension System: Exposed grid Type 1 (White).
- C. Glass Fiber: Type ACP-2, painted fabric faced glass fiber, ASTM E1264 Type XII, with the following characteristics:
1. Size: Custom size as shown.
 2. Thickness: 1-1/2 inches.
 3. NRC Range: 0.90 determined as specified in ASTM E1264.
 4. Edge: Square.
 5. Surface Color: White.
 6. Product: Echophon Solo by Certainted.
 7. Suspension System: Concealed cable supportsystem.
- D. Reflective Acoustical Panel Type ACP-3, painted gypsum board.
1. Material: Refer to Section 09 21 16 - Gypsum Board Assemblies.
 2. Size: Custom size as shown.
 3. Surface Color: White.
 4. Suspension System: Concealed wire hangers. Refer to Section 09 21 16 - Gypsum Board Assemblies for details.
- E. Acoustical Panels Type ACP-4: Ceramic and mineral fiber composite , ASTM E1264, Type XX with the following characteristics:
1. Size: 24 x 24 inches.
 2. Thickness: 5/8 inches.
 3. NRC Range: 0.50 to 0.55, determined as specified in ASTM E1264.
 4. Ceiling Attenuation Class (CAC): 38, determined as specified in ASTM E1264.
 5. Edge: Square.
 6. Surface Color: White.
 7. Surface Pattern: Non-directional fissured.
 8. Product: Ceramaguard Fine Fissured by Armstrong.
 9. Suspension System: Exposed grid Type 2 (White).
- F. Acoustical Panels Type [ACP-5]: Painted mineral fiber, ASTM E1264, Type IV with the following characteristics:
1. Size: 24 x 24 inches.
 2. Thickness: 5/8 inches.
 3. NRC Range: 0.55 determined as specified in ASTM E1264.
 4. Ceiling Attenuation Class (CAC): 38, determined as specified in ASTM E1264.

5. Edge: Square.
 6. Surface Color: White.
 7. Surface Pattern: Non-directional holes.
 8. Product: Cortega Square Lay-in by Armstrong.
 9. Suspension System: Exposed grid Type 1 (White).
- G. Egg Crate Ceiling Panels ACP -6: Aluminum egg crate lay-in panels.
1. Size: 23-3/4 x 47-3/4 inches
 2. Thickness: 1/2 inch
 3. Edge: Square.
 4. Color: Black.
 5. Product: Open cell egg crate diffuser by Diffuser Specialist, 10612 Hempstead Hwy. Ste D, Houston, TX 77092; Tel. (713) 632-4555, Email: diffuserspecialist.com
 6. Suspension System: Exposed grid Type 1 (Black).

2.02 SUSPENSION SYSTEM(S)

- A. Manufacturers:
1. Armstrong World Industries, Inc: www.armstrong.com.
 2. USG: www.usg.com.
 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Suspension Systems - General: ASTM C635; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.
- C. Exposed Steel Suspension System Type 1: Formed steel, commercial quality cold rolled; intermediate-duty.
1. Profile: Tee; 15/16 inch wide face.
 2. Construction: Double web.
 3. Finish: To match ceiling panel finish.
 4. Product: Prelude XL by Armstrong.
- D. Exposed Steel Suspension System Type 2: Formed G90 hot-dipped galvanized steel, commercial quality cold rolled; intermediate-duty.
1. Profile: Tee; 15/16 inch wide face.
 2. Construction: Double web.
 3. Finish: White painted.
 4. Product: Prelude Plus XL by Armstrong.
- E. Concealed Suspension System Type 3: Spiral wire panel attachment anchors with adjustable cable hanging system.
1. Product: Connect System manufactured by Certainteed.

2.03 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Perimeter Moldings: Same material and finish as grid.
1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
- C. Acoustical Sealant For Perimeter Moldings: Specified in Section 07 90 05.
- D. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- D. 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.
- E. 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.
- F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- H. Do not eccentrically load system or induce rotation of runners.
- I. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
 - 2. Overlap and rivet corners.

3.02 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. Make field cut edges of same profile as factory edges.
- G. Where round obstructions occur, provide preformed closures to match perimeter molding.

3.03 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.

END OF SECTION

SECTION 09 54 00
ACOUSTICAL WOOD PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Wood veneer panels that are perforated for wall application.
- C. Sound absorbing blanket.
- D. Hardware as required for attachment to substrate.

1.02 RELATED SECTIONS

- A. Section 06 4000 - Finish and Architectural Woodwork

1.03 REFERENCES

- A. International Organization for Standardization
 - 1. ISO 354 - Measurement of Sound Absorption in a Reverberation Room
 - 2. ISO 10534 - Determination of sound absorption coefficient and impedance in impedance tubes - Part 1: Method using standing wave ratio.
- B. American Society for Testing & Materials (ASTM)
 - 1. ASTM E 1050-98 - Standard Test Method for Impedance and Absorption of Acoustical Materials Using a Tube, Two Microphones, and a Digital Frequency Analysis System
 - 2. ASTM C 423 - Sound Absorption & Sound Absorption Coefficients by the Reverberation Room Method
 - 3. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.

1.04 SYSTEM DESCRIPTION

- A. Design Requirements: Sound absorption shall be provided by viscous losses in the sub-millimeter perforations, as well as resonant Helmholtz absorption. Viscous losses result when the microperforation diameter is comparable in to the boundary layer of air, roughly 0.5 mm (0.02"). This shall be achieved using 30,000 microperforations 0.6 mm (0.024") in diameter in a 1 mm (0.039") thick wood veneer. The veneer shall be applied to a 16 mm (0.63") substrate with 6 mm (0.23") diameter holes spaced in a hexagonal arrangement 8 mm (0.31") apart. The rear surface shall be covered with a non-woven matt to provide a resistive layer, as well as a porous absorber in the rear air cavity.
- B. Performance Requirements
 - 1. Third-octave band acoustical performance requirements from 100 Hz to 5000 Hz for random incidence sound absorption shall be measured according to ASTM C423 or ISO 354. The random incidence absorption coefficients shall be what are indicated in the table below:

Hz	A	B	C
100	0.11	0.13	0.35
125	0.18	0.20	0.43
160	0.30	0.33	0.55
200	0.55	0.61	0.78
250	0.75	0.80	0.81

315	0.96	1.00	0.98
400	1.08	1.10	0.96
500	1.13	1.12	0.94
630	1.10	1.14	0.93
800	1.04	1.01	0.96
1000	1.03	1.00	1.00
1250	0.95	0.92	1.00
1600	0.91	0.89	0.95
2000	0.88	0.88	0.90
2500	0.81	0.85	0.87
3150	0.77	0.79	0.82
4000	0.74	0.75	0.80
5000	0.69	0.71	0.71

Test A is with a non-woven matt and 40 mm (1.57") of mineral wool on the rear surface, separated from the boundary with a 10 mm (0.4") air cavity.

Test B is with a non-woven matt and 40 mm (1.57") of mineral wool on the rear surface, separated from the boundary with a 30 mm (1.2") air cavity.

Test C is with a non-woven matt and 40 mm (1.57") of mineral wool on the rear surface, separated from the boundary with a 170 mm (6.7") air cavity.

2. Normal incidence sound absorption coefficients shall be measured according to the impedance tube method according to ASTM E1050-98 or ISO 10534.

Hz	A
500	0.80
630	0.88
800	0.89
1000	0.86
1250	0.82
1600	0.75
2000	0.71
2500	0.70
3150	0.64
4000	0.55

- a. Test A is with a non-woven matt and 40 mm (1.57") of 6 pcf fiberglass on the rear surface, separated from the boundary with no air cavity.

1.05 SUBMITTALS

- A. Product Data: Submit manufacturers' technical data including basic system description, options and component sizes. Identify all applicable features and options. Cross out any inapplicable features or options.
- B. Shop Drawings: The contractor shall produce and submit shop drawings of products and suspension or mounting systems overlaid on base drawings (interior elevations or reflected ceiling plans) supplied electronically by the architect. Show overall layout with dimensions and references to details as necessary for penetrations, joints, ends and intersections with other materials or building components. Submit schedule of all quantities, sizes, hole

patterns, edge banding, borders, veneers and finishes. Field-verify site conditions with dimensions shown on shop drawings.

- C. Samples: Minimum 29.2 cm (11-1/2") x 22.9 cm (9") sample of specified panel and finish with black, nonwoven, fiber backing material; 20.3cm (8") length samples of any exposed wall molding to be provided by manufacturer.
- D. Certifications: Manufacturers' certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.

1.06 QUALITY ASSURANCE

- A. Qualifications: Manufacturer and installation contractor shall have a minimum of three years experience with similar systems.
- B. Single Source: All products under this section shall be supplied by a single manufacturer to ensure consistency in product size and finish.
- C. Woodworking Standards: Manufacturer to comply with specified provisions of Architectural Woodworking Institute quality standards.
- D. Flame Spread / Smoke Developed Characteristics: Tested by independent, accredited facility.
 - 1. Noncombustible (A2) Core: Cement or Gypsum
 - 2. Tests: DIN 4102
 - 3. Class A (B1) Core: Medium density fiberboard (MDF) type B1
 - 4. Tests: ASTM E 84, NFPA 255 & DIN 4102
 - 5. Composite Flame Spread Rating: 25 (maximum)
 - 6. Smoke Developed: 450 (maximum)
 - 7. Flammable (B2) Core: Medium density fiberboard (MDF) type B2
 - 8. Tests: DIN 4102
- E. Pre-Installation Meeting: Installing contractor shall organize and conduct pre-installation meetings with all other trades to coordinate substrate conditions, conditioning of the space (temperature & humidity), and elements attaching to, penetrating through or concealed above/behind work in this section.

1.07 DELIVERY STORAGE AND HANDLING

- A. Shipping, Handling and Unloading: Deliver wood panels to the project site in the manufacturer's original, unopened packaging. Do not unpack or handle finished products until the project environmental requirements have been met and the products are ready to be installed.
- B. Storage and Protection: Store all wood panels and associated wood trim pieces in a clean, dry, fully-enclosed storage facility. Protect products from damage that may be caused by exposure to water, chemicals, direct sunlight or infestation.
- C. Acceptance at Site: Ensure that all project environmental requirements have been met prior to unpacking or installing wood panels and all associated wood trim products. Full or partial installation constitutes complete product acceptance.
- D. Waste Management and Disposal: Dispose of all packaging materials and debris in a safe and environmentally responsible manner according to the instructions set forth by the General Contractor, local ordinances or codes and the Environmental Protection Agency.

1.08 PROJECT CONDITIONS

- A. Project Environmental Requirements: Prior to unpacking or installing wood products, ensure that the installation area is fully enclosed and protected from moisture and direct

sunlight. Ensure that the building's mechanical systems are fully operational and will not be turned off again even for testing and balancing of the mechanical systems. Coordinate with other trades to ensure that all work above or behind wood surfaces is complete and that all wet and dusty trades have completed work.

- B. Product Acclimation: For a minimum period of seventy-two (72) hours and prior to unpacking or installing any wood products, allow both the installation area and the wood products to stabilize in temperature and humidity levels that are representative of the final temperature and humidity levels expected after building completion and occupation. Do not install products if the humidity exceeds 65%.
- C. Product Handling: Handle wood panels carefully so as to avoid chipping, scratching, scuffing or denting the wood finish or edges.

1.09 WARRANTY

- A. Submit to Owner or Owner's Representative a written and dated warranty issued by the wood ceiling/wall manufacturer warranting the wood panels and associated trim pieces against defects in materials or manufacturing for a period of one (1) year from the date of delivery.
- B. Components used in the system but not provided by the manufacturer are excluded from the manufacturer's warranty. Damage caused by exposure to moisture or rapid or extreme changes to temperature or humidity are excluded from the manufacturer's warranty. Damage caused by improper storage, handling, acclimatization, or installation is excluded from the warranty. Appearances and colorings of wood products, stains and finishes can vary over time and as site conditions change and are therefore excluded from the warranty.

1.10 OWNER'S INSTRUCTIONS

- A. Installing contractor shall provide to the building owner or to the owner's representative a copy of the manufacturer's maintenance manual supplied with the panels.

1.11 MAINTENANCE

- A. Extra Materials: If provided per the project requirements, extra materials shall remain in the manufacturer's original, unopened packaging and shall be given to the building owner or owner's representative upon substantial completion of work.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. RPG Diffusor Systems, Inc., 651-C Commerce Drive, Upper Marlboro, MD 20774
301-249-0044 (telephone), 301-249-3912 (facsimile), <http://www.rpginc.com>.

2.02 MATERIALS

- A. Core (standard): Medium density fiberboard (MDF) made of soft and hard wood fibers with added binding agents, 16 mm (0.67") thick.
- B. Veneer:
 - 1. Natural Wood: Maple as selected by architect (1 mm thickness).
- C. Backing Fabric: Nonwoven, black, glass fiber matt, 60 g/m² (0.012 psf) surface weight.
- D. Acoustic Insulation: Nonwoven, black, glass fiber batt (or mineral wool), 25.4 mm (1") thick, 50 kg/m³ (3 pcf) density (optional).

2.03 MANUFACTURED UNITS

- A. Panels:
 - 1. Width: As shown.
 - 2. Length: As shown.

3. Thickness: 17 mm (natural wood veneer)
4. Perforations: 0.6mm (0.023") diameter micro-perforations in a 1 mm (0.039") thick wood veneer. The veneer shall be applied to a 16 mm (0.63") substrate with 6 mm (0.23") diameter holes spaced in a hexagonal arrangement 8 mm (0.31") apart.
5. Edge conditions
 - a. Concealed
 - 1) Standard: Straight cut, no veneer, unfinished, partial perforations visible.
 - b. Visible
 - 1) Edeg molding: Custom trim per drawings.

2.04 ACCESSORIES

- A. Edge Moldings: Standard edge molding Type 1 per drawings. Finish to match finish on panels.
- B. Custom Trim: Custom wood trim pieces per drawings finished to match finish on panels.
- C. Ceiling Grid Systems: Type G.

2.05 FABRICATION

- A. Shop Assembly: Panels used in downwardly accessible, suspended, concealed grid, ceiling systems shall have acoustic insulation adhered to the panel backs (optional) and hardware such as braces or spring torsion clips pre-fastened for direct attachment to ceiling grid system.
- B. Fabrication Tolerances - 0.10 mm (perforations); 0.50 mm (lengths & widths)

2.06 FINISHES

- A. Shop Finishing: Panels shall be shop-finished with stain per selection by architect and clear, semi-gloss varnish (wood veneers) or painted (matte finish) per color selection by architect.

2.07 SOURCE QUALITY CONTROL

- A. Manufacturing facility for panels shall be ISO 9001 certified and provide certification documentation upon request by Architect.

PART 3 EXECUTION

3.01 INSTALLERS

- A. Installing contractor shall have a minimum of five (5) years successful experience installing wood ceiling and wall systems in similar applications using similar mounting techniques or suspension systems.

3.02 EXAMINATION

- A. Site Verification of Conditions: Examine installation area for compliance with all manufacturers' project environmental requirements and ensure uninstalled products have been stored, handled and acclimatized properly prior to commencing installation. Inspect all substrates for completion and quality of work to ensure that surfaces are level, plumb, clean, dry and completely cured from water or solvent evaporation. Do not commence installation if the structural capacity of the substrate is questionable or inadequate.
- B. Coordination with Other Trades: Coordinate with all other trades to ensure that wet work including concrete, terrazzo, plastering, painting, etc. in the installation area is complete, cured and dry prior to installation. Coordinate with all other trades to verify that components associated with mechanical, electrical, lighting, data, telecommunication, audio, video, fire suppression and other building systems are installed behind or above designated installation areas prior to commencing installation. Coordinate the exact size, location and sequencing of building system components that penetrate the wood ceiling/wall panels.

3.03 PREPARATION

- A. Protection: Protect all floor, wall and ceiling finishes against possible damage prior to commencing installation and during installation.
- B. Surface Preparation: When necessary, field measure substrates to acquire accurate dimensions of wood panels and submit final dimensions to manufacturer.

3.04 INSTALLATION

- A. Install wood panels as shown and detailed in the architectural drawings and according to manufacture's guidelines and industry standards.
- B. Install wood panels with expansion/contraction gaps equal to 1 mm (1/32") for every 1 meter (3.28') of length/width (3 mm minimum between panels).

3.05 CONSTRUCTION

- A. Interface with Other Work: Support all light fixtures, HVAC air inlet/outlet devices, speakers, signage, sprinkler heads/piping, etc. independently from wood panels. Contractor shall not use wood panels to support the weight of any other building element or component.

3.06 ADJUSTING

- A. Following initial installation, adjust mounting hardware or suspension system so that removable panels can be removed easily, yet stay safely secured upon replacement. Adjust panels so that surfaces are aligned, flush and level or plumb and gaps in between units are of a consistent width and straight.
- B. Check that manufacturer's expansion/contraction requirements were maintained during installation. As required, adjust the mounting hardware or suspension system to allow for the appropriate amount of product expansion/contraction.
- C. Remove and replace at no extra charge any damaged panels that cannot be repaired to the Owner's and Architect's satisfaction.

3.07 CLEANING

- A. Remove dust from surfaces and penetrations by vacuuming using only a soft brush. Do not scratch wood surfaces with sharp metal or plastic vacuum cleaner extensions. Remove pencil marks with soft erasure. Remove general surface dirt with a clean, soft cloth dampened with a diluted, mild, cleaning agent and warm water. Wipe again with clean, soft cloth dampened only with warm water. Finally, dry surface completely with clean, dry cloth. Do not use abrasive cleaners with grit or cloths that could scratch the wood finish.
- B. Remove and replace at no additional charge any materials that cannot be cleaned to the Owner's satisfaction.

3.08 DEMONSTRATION

- A. Demonstrate to the building owner or to the owner's representative the safe and proper method for removing and replacing all types of accessible panels.
- B. Supply the building owner or the owner's representative with any special tools provided by the manufacturer required to unlatch safety hardware on accessible panels.

3.09 PROTECTION

- A. Upon completion of work, protect installed wood surfaces from damage or soiling until project substantial completion and owner occupancy.

END OF SECTION

SECTION 09 64 10
WOOD STRIP FLOORING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Wood stripfloor system.

1.02 ACTION SUBMITTALS

- A. 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 methods.
- B. Shop Drawings:
 - 1. Layout of flooring and details of installation.
- C. Selection Samples: For each finish product specified, two complete sets of color samples representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.03 QUALIFICATIONS

- A. Installer: Minimum 10 years of documented experience with wood flooring, employed by flooring supplier, and approved by manufacturer. Submit list of three (3) projects of similar magnitude and complexity to this subject.

1.04 PACKING AND DELIVERY

- A. Packing: Non-staining, providing protection from moisture, yet allowing adequate air circulation, limit moisture content to 8 percent maximum for any piece.
- B. Delivery: Unopened bundles; do not deliver wood materials, until "wet" work has been completed and cured to a condition of equilibrium. Spaces to receive wood must be enclosed, dry and maintained at the same humidity condition as planned for occupancy.

1.05 ENVIRONMENTAL CONDITIONS

- A. Temperature: Maintain ambient temperature in range of 60 degrees to 90 degrees F. and relative humidity of 35 to 50 percent prior to, during, and after installation of wood flooring.

PART 2 PRODUCTS

2.01 MAPLE FLOORING SYSTEM

- A. Maple Flooring: Second and Better, non-finger jointed, 23/32 inch by 2-1/4 inch width, edge grain, northern hard maple. Flooring may be factory finished as specified; however this does not relieve responsibility for damage and non-uniformity of finish on installed floor.
- B. Location: as noted on the drawings.

2.02 ACCESSORY MATERIALS

- A. Vapor Barrier: 6 mil polyethelene with joints lapped at least 4 inches and cemented with cold asphalt.
- B. Wood Filler: Paste type wood Filler, pigmented if necessary to match wood specie and finish color.
- C. Polyurethane Finish: Moisture curing type polyurethane finish specially compounded for multiple-coat application on wood floors; FS TT-C-542.

- D. Cork Expansion Strip: Composition cork expansion strip FS HH-C-576, Type I-B, Class 2.

2.03 FINISH MATERIALS

- A. Water Based Urethane Finish System: Group 3 Type Finish as certified by Maple Flooring Manufacturers Association.

PART 3 EXECUTION

3.01 PREPARATION

- A. Conditions: Examine substrates on which wood flooring will be installed, and conditions under which the Work will be performed. Do not proceed with Work until unsatisfactory conditions and/or conditions detrimental to the proper completion and maintenance of wood flooring have been corrected.
- B. Substrates: Properly level, smooth and clean substrates so as to comply with recommendations of MFMA and WSFI.
- C. Verify surfaces are thoroughly dry. Perform moisture test and obtain acceptable results before starting work.
- D. Wood Conditioning: Place flooring materials in respective rooms or spaces 7 days in advance of the installation. Open sealed packages (if any) to permit natural adjustment of moisture content.

3.02 INSTALLATION

- A. Cover concrete with polyethylene, sealing and lapping joints a minimum of 6 inches.
- B. Attach cork expansion material around perimeter to restrain movement of flooring system.
- C. Place base layer of plywood subflooring on sleepers. Fasten as necessary to prevent shifting of boards as secondary layer is placed.
- D. Install in accordance with MFMA instructions: predrill and blind nail to sleepers.
 - 1. Arrange flooring with end matched grain set flush and tight.
 - 2. Install edge strips at exposed edges. Secure edge strips before installation of flooring with stainless steel screws.
 - 3. Provide 3/4 inch expansion space at fixed walls and other interruptions.

3.03 FINISHING AND REFINISHING

- A. Wood Strip Flooring:
 - 1. Apply 2 coats of sealer and 2 coats of finish.
- B. Finish: Apply 2 or more coats of penetrating sealer buffed in accordance with manufacturer's instructions in order to provide a low gloss flat finish.

3.04 BASE INSTALLATION

- A. Install vented wood base in accordance with manufacturer's instructions and as shown.

3.05 PROTECTION

- A. Protect flooring with non-fibred kraft paper or resin paper with taped joints.
- B. Prevent access to space with locked doors.

END OF SECTION

SECTION 09 64 29
STAGE FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Hardboard floor system for Auditorium stage.
- C. Secondary subflooring.
- D. Sleepers on cushion blocks.
- E. Sheet vapor retarder.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00-Concrete: Recessed concrete subfloor surface and formed depressions for deep floor sockets, inserts, and installation of vapor barrier.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate floor joint pattern and termination details.
 - 1. Indicate provisions for expansion and contraction.
- C. Installation Instructions: Indicate standard and special installation procedures.
- D. Maintenance Data: Include maintenance procedures.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of this section with minimum five years experience.

1.05 FIELD CONDITIONS

- A. Do not install wood flooring until wet construction work is complete and ambient air at installation space has moisture content stabilized at maximum moisture content of 40 percent.
- B. Provide heat, light, and ventilation prior to installation.
- C. Store materials in area of installation for minimum period of 24 hours prior to installation.
- D. Maintain minimum room temperature of 65 degrees F for a period of two days prior to delivery of materials to installation space, during installation, and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Stage Flooring:
 - 1. Hardboard Surface Panel: ANSI/AHA A 135.4, Class 1 (tempered) as extended herein; minimum density 63 to 68 pcf; specific gravity 1.00 to 1.09; internal bond strength greater than 215, modulus of rupture 5400 to 6000 psi; tensile strength 2200 to 3750; 24-hour water soak thickness swell not exceed 16 percent; weight gain not exceed 22 percent; S2S surface; uniform thickness of 0.375 inch, plus or minus 0.015 inch; in panel sizes of 4 feet by 8 feet.
 - 2. Subfloor: 1" X 6" (nominal) Spruce, Pine, Fir, Hemlock, S4S, random length.

3. Plywood underlayment: 2 layers of 15/32 inch thick plywood; Exposure 1 , sanded , preservative treated.
 4. Channels: 16 gauge steel channel rails.
 5. Channel Anchors: min. 900 lb. pull-out.
 6. Resilient pads: 7/16 inch by 2 inch by 2 inch, black 60 durometer.
- B. Flooring Nails: Type recommended by flooring installer.
- C. Secondary Subflooring: 15/32 inch thick plywood, with tongue and groove edges; Exposure 1, sanded, preservative treated.
- D. Vapor Retarder: Black polyethylene sheet, 6 mil thick; 2 inch wide tape for joint sealing.

2.02 ACCESSORIES

- A. Ventilating Base: Molded rubber, 4 inch high with a 3 inch toe, ventilating type, with adhesives and accessories, black.
- B. Cushion Blocks: Resilient pads, rubber material, sealed air channels for resiliency; compressible to 1/16 inch under a 40 psi load with full and immediate recovery.
- C. Floor Finish: GemThane AquaTech STC Top Coat over MG 201 Sealer/Primer.
1. Manufacturer: Madison Chemical, 490 McGeachie Drive, Milton, Ontario Canada, L9T 3Y5; Tel: (905) 878-8863, Fax: (905) 878-1449; Email: www.madisonchemical.com/gemthane/gemthane_products

PART 3 EXECUTION

3.01 PREPARATION

- A. Sleepers and Shims:
1. Shim underside of sleepers to achieve level line of plus or minus 1/4 inch in 10 feet.
- B. Cushioned Sleepers:
1. Secure cushion blocks to underside of sleepers at 16 inches oc and at each end. Shim between blocks and sleepers for equal bearing on floor surface and to achieve level line of plus or minus 1/4 inch in 10 feet.
 2. Place sleepers over subfloor; space sleepers as per manufacturer's instructions perpendicular to room length; do not secure to subfloor.
- C. Secondary Subflooring: Place two layers of plywood subflooring over sleepers.
1. Lay the first layer perpendicular to the sleepers, with end joints over sleepers, and nail at 12 inches on center.
- D. Prepare substrate to receive wood flooring in accordance with manufacturer's and MFMA instructions.
- E. Broom clean substrate.

3.02 INSTALLATION

- A. Sheathing Paper: Place over wood subfloor; lap edges and ends 2 inches, staple in place.
- B. Wood Flooring:
1. Predrill and blind nail to sleepers.
 2. Lay flooring parallel to length of room areas. Verify alignment as work progresses.
 3. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar; provide divider strips and transition strips in accordance with flooring manufacturer's recommendations and as indicated..
 4. Install edge strips at unprotected or exposed edges, and where flooring terminates.
 5. Secure edge strips before installation of flooring with stainless steel screws.
 6. Install flooring tight to floor access covers.
 7. Provide 3/4 inch expansion space at fixed walls and other interruptions.

C. Finishing:

1. Apply finish in accordance with floor finish manufacturer's instructions.

3.03 CLEANING

- A. Clean and polish floor surfaces in accordance with manufacturer's instructions.

3.04 PROTECTION

- A. Prohibit traffic on floor finish for 48 hours after installation.
- B. Place protective coverings over finished floors; do not remove coverings until Substantial Completion.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 1000, 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.
- B. Resilient tile flooring.
- C. Resilient base.
- D. Installation accessories.

1.02 RELATED REQUIREMENTS

- A. Section 09 05 61 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, cleaning, and 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; 2010e1.
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.
- C. ASTM F1344 - Standard Specification for Rubber Floor Tile; 2012.
- D. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012).
- E. BAAQMD 8-51 - Bay Area Air Quality Management District Regulation 8, Rule 51, Adhesive and Sealant Products; www.baaqmd.gov; 2002.
- F. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; Resilient Floor Covering Institute; October 2011.
- G. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

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; 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, 12 x 12 inch in size illustrating color and pattern for each resilient flooring product specified.
- E. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.

1.05 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.

PART 2 PRODUCTS

2.01 TILE FLOORING

- A. Rubber Tile: Homogeneous color and pattern throughout thickness, and:
1. Minimum Requirements: Comply with ASTM F1344, of Class corresponding to type specified.
 2. Design: Sculptured.
 3. Size: 18-1/8 x 18-1/8 inch.
 4. Overall Thickness: 0.125 inch.
 5. Pattern: Solid color.
 6. Manufacturers:
 - a. Mannington; Product ColorSpec.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 RESILIENT BASE

- A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove, and as follows:
1. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648.
 2. Height: 4 inch.
 3. Thickness: 0.125 inch thick.
 4. Finish: Satin.
 5. Length: Roll.
 6. Color: Color as selected from manufacturer's standards.
 7. Manufacturers:
 - a. Johnsonite, Inc; Product Rubber Wall Base: www.johnsonite.com.
 - b. Substitutions: See Section 01 60 00 - Product Requirements.

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, Transition and Edge Strips: manufactured by Johnsonite, Inc.

PART 3 EXECUTION

3.01 EXAMINATION

- A. 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 flooring to substrate.
- B. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
1. Test in accordance with Section 09 05 61.
 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

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. 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. Spread only enough adhesive to permit installation of materials before initial set.
- D. Fit joints tightly.
- E. Set flooring in place, press with heavy roller to attain full adhesion.
- F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
- H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless manufacturer's instructions say otherwise.
- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.
- C. Install tile to monolithic pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

3.05 RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold.
- 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 excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's instructions.

3.07 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 65 66
RESILIENT DANCE FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Portable vinyl sheet flooring, loose laid installation.
- C. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Selection Samples: Manufacturer's color charts for flooring materials specified, indicating full range of colors and textures available.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer certified in writing by the flooring manufacturer to be qualified for installation of specified flooring system.

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.

PART 2 PRODUCTS

2.01 PREFORMED DANCE FLOORING

- A. Vinyl Sheet Flooring:
 - 1. Product: Cascade Portable Vinyl Floor manufactured by Harlequin.
 - 2. Wearing Surface: Pure polyvinyl chloride, mechanically extruded and uniformly resilient material.
 - 3. Sheet Thickness: Minimum 0.08 in.
 - 4. Surface Texture: Smooth.
 - 5. Color: As selected from manufacturer's standards.

2.02 ACCESSORIES

- A. Roll Storage Cart
 - 1. Product: 6 Roll Cart manufactured by Harlequin.

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.

3.02 PREPARATION

- A. Broom clean areas to receive flooring immediately before beginning installation.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Comply with manufacturer's recommendations and approved shop drawings.

3.04 CLEANING

- A. Clean flooring using methods recommended by manufacturer.

3.05 PROTECTION

- A. Protect finished athletic flooring from construction traffic to insure that it is without damage upon completion of the work.

END OF SECTION

SECTION 09 66 13
PORTLAND CEMENT TERRAZZO FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cast-in-place terrazzo floor.
- B. Divider strips and termination edging.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C150, Type I Normal; white color for topping mix; gray color for underbed; modified to NTMA higher compressive strength requirements; obtained from single source.
- B. Color Pigments For Topping: Non-fading mineral type, alkali-resistant.
- C. Terrazzo Sand: ASTM C33, fine aggregates.
- D. Cushion Sand: ASTM C33, fine aggregates.
- E. Water: Potable.
- F. Surface Aggregate: Type, color, and size to match existing.

2.02 ACCESSORIES

- A. Divider Strips: Match existing 1/8 inch thick zinc exposed top strip, zinc coated steel concealed bottom strip, with anchoring features.
- B. Control Joint Strips: 1/8 inch nominal width zinc exposed top strips, zinc coated steel concealed bottom strip, 1/8 inch wide neoprene filler strip between vertical strips, with anchoring features.
- C. Divider and Control Joint Strip Height: To suit thickness of terrazzo topping, with allowance for grinding.
- D. Slip Sheet: ASTM D2103; 4 mil polyethylene sheet.

2.03 MIXES

- A. Underbed: One part portland cement to 4 parts sand by volume. Add water to produce low slump mix.
- B. Floor: Comply with mix requirements of NTMA Plate No. to match existing terrazzo, white portland cement, with exposed divider and accessory strips.

PART 3 EXECUTION

3.01 APPLICATION - SAND CUSHION TERRAZZO

- A. Place sand cover over structural floor substrate to a nominal thickness of 1/8 inch, and roll smooth.
- B. Place slip sheet over sand bed surface, lapping edges and ends 2 inches.
- C. Place cementitious underbed over slip sheet to nominal thickness of 1-3/4 inches. Broom finish top surface.
- D. Place divider strips and control joints at locations indicated and insert in semi-plastic uncured underbed. Install straight and level.

END OF SECTION

SECTION 09 68 00
CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 1000, 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.
- B. Carpet, direct-glued.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 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, colors available, and method of installation.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet with minimum three years experience.

1.05 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.
- B. Ventilate installation area during installation and for 72 hours after installation.

PART 2 PRODUCTS

2.01 CARPET

- A. Carpet Type CPT-1:
 - 1. Product: Atoll 03333 manufactured by Tandus Flooring.
 - 2. Roll Width: 6 ft.
 - 3. Yarn Type: Antron Legacy
 - 4. Dye Method: Solution/Yarn Dyed
 - 5. Gauge: 5/64 inch
 - 6. Pattern Match: 18.125 inches W x 36 inches L.
 - 7. Powerbond construction: ethos.
 - 8. Color: To be selected from standard palette.

2.02 ACCESSORIES

- A. Sub-Floor Filler: Type recommended by carpet manufacturer.
- B. Moldings and Edge Strips: Rubber, color as selected.
- C. Adhesives - General: Compatible with materials being adhered; maximum VOC content as specified in Section 01 61 16.
- D. Seam Adhesive: Recommended by manufacturer.
- E. Contact Adhesive: Compatible with carpet material; 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. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
 - 1. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- D. Clean substrate.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install carpet and cushion in accordance with manufacturer's instructions and CRI Carpet Installation Standard.
- C. Verify carpet match before cutting to ensure minimal variation between dye lots.
- D. Lay out carpet and locate seams in accordance with shop drawings:
 - 1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
 - 2. Do not locate seams perpendicular through door openings.
 - 3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
 - 4. Locate change of color or pattern between rooms under door centerline.
 - 5. Provide monolithic color, pattern, and texture match within any one area.
- E. 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

SECTION 09 68 13
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 74 19 - Construction Waste Management and Disposal: Reclamation/Recycling of new carpet tile scrap.
- C. Section 09 05 61 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, cleaning, and 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; 2010e1.
- B. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2009.
- C. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug Institute; Current Edition.

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, colors available, and method of installation.
- C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet with minimum three years experience.

1.06 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Carpet Tile Type WOC-1: Tip-sheared loop, manufactured in one color dye lot.
 - 1. Product: Ruffian II manufactured by Mannington.
 - 2. Tile Size: 24 x 24 inch, nominal.
 - 3. Color: See Finish Schedule.

2.02 ACCESSORIES

- A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Edge Strips: Rubber, matching color.
- C. Adhesives: Acceptable to carpet tile manufacturer, compatible with materials being adhered; maximum VOC of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.
- C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
 - 1. Test in accordance with Section 09 05 61.
 - 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

- A. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions and CRI Carpet Installation Standard.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in square pattern or as scheduled and shown, with pile direction alternating to next unit, set parallel to building lines.
- F. Fully adhere carpet tile to substrate.
- G. Trim carpet tile neatly at walls and around interruptions.
- H. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 90 01
PAINTS AND COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Surfaces to be finished are indicated in this section and on the Drawings.

1.02 RELATED REQUIREMENTS

- A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 05 50 00 - Metal Fabrications: Shop-primed items.

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. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Master Painters and Decorators Association; 2004.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of all products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system (copy of relevant MPI Manual page is acceptable).
- C. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.
- D. Samples: Submit one paper "drop" samples, 8-1/2 by 11 inches in size, illustrating colors selected for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.

1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years experience.
- B. Material Safety Data Sheets: At project site maintain file of MSDS sheets for each product used; become familiar with and follow manufacturer's stated application and safety requirements.

1.06 MOCK-UP

- A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.
- B. Provide wall panel, 8 feet long by 10 feet wide, illustrating coating color, texture, and finish.
- C. Locate where directed.
- D. Mock-up may remain as part of the Work.

1.07 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.

1.08 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. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.09 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 in addition to the manufacturer's label.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide all paint and coating products from the same manufacturer to the greatest extent possible.
- B. In the event that a single manufacturer cannot provide all specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- C. Paints: Acceptable manufacturers are limited to the following:
 - 1. Benjamin Moore & Co: www.benjaminmoore.com.
 - 2. Sherwin-Williams: www.sherwin-williams.com.
 - 3. Glidden Professional: www.gliddenprofessional.com.
- D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS - GENERAL

- A. Volatile Organic Compound (VOC) Content:
 - 1. Provide coatings that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings; www.otcair.org; specifically:
 - 1) Opaque, Flat: 50 g/L, maximum.
 - 2) Opaque, Nonflat: 150 g/L, maximum.
 - 3) Opaque, High Gloss: 250 g/L, maximum.

- 4) Varnishes: 350 g/L, maximum.
- c. Architectural coatings VOC limits of State in which the project is located.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- B. Paints and Coatings: Provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI Categories, except as otherwise indicated.
 1. Provide ready mixed paints and coatings .
 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

2.03 PAINT SYSTEMS

- A. Provide Premium Grade systems (2 top coats) as defined in MPI Architectural Painting Specification Manual, except as otherwise indicated.
- B. Provide colors as directed by Architect.
 1. Allow for minimum of five colors for each system, unless otherwise indicated, without additional cost to Owner.
 2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.04 EXTERIOR PAINT SYSTEMS

- A. Concrete Masonry Units:
 1. _____: EXT 4.2C W.B. Light Industrial Coating: Block Filler MPI #4, W.B. Light Industrial Coating MPI #161, #163, or #164.
- B. SYSTEM E-1:
 1. Substrate: Structural Steel and Metal Fabrications:
 2. Applications include but are not limited to miscellaneous metal boxes and covers.
 3. Manufacturers and products:
 - a. Sherwin Williams:
 - 1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series
 - 2) 2nd Coat: S-W A-100 Exterior Latex Gloss, A8 Series
 - 3) 3rd Coat: S-W A-100 Exterior Latex Gloss, A8 Series
 - b. Benjamin Moore:
 - 1) 1st Coat: Moore PO6 Super Spec HP Alkyd Metal Primer
 - 2) 2nd Coat: 096 MoorGlo Acrylic Semi-Gloss House Paint
 - 3) 3rd Coat: 096 MoorGlo Acrylic Semi-Gloss House Paint
 - c. Glidden Professional:
 - 1) 1st Coat: Devoe Coatings DEVFLEX Direct-to-Metal 4020 primer
 - 2) 2nd Coat: Glidden Professional Fortis 450 6407 topcoat
 - 3) 3rd Coat: Glidden Professional Fortis 450 6407 topcoat
 4. _____: EXT 5.1M, W.B. Light Industrial Coating: Rust Inhibitive Primer MPI #107, W.B. Light Industrial Coating MPI #161, #163, or #164.
- C. SYSTEM E-2:
 1. Substrate: Galvanized Metal, Not Chromate Passivated:
 2. Applications include but are not limited to doors and frames, lintels and bollards.
 3. Manufacturers and Products:
 - a. Sherwin Williams:
 - 1) 1st Coat:S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series

- 2) 2nd Coat:S-W DTM Acrylic Coating, Semi-Gloss, B66-200 Series
- 3) 3rd Coat:S-W DTM Acrylic Coating, Semi-Gloss, B66-200 Series
- b. Benjamin Moore:
 - 1) 1st Coat: Moore P04 Super Spec HP Acrylic Metal Primer
 - 2) 2nd Coat:Moore N096 MoorGlo Acrylic Semi-Gloss House Paint
 - 3) 3rd Coat:Moore N096 MoorGlo Acrylic Semi-Gloss House Paint
- c. Glidden Professional:
 - 1) 1st Coat: Devoe Coatings DEVFLEX Direct-to-Metal 4020 primer
 - 2) 2nd Coat: Glidden Professional Fortis 450 6407 topcoat
 - 3) 3rd Coat: Glidden Professional Fortis 450 6407 topcoat
4. _____: EXT 5.3J W.B. Light Industrial Coating: W.B. Primer MPI #134, W.B. Light Industrial Coating MPI #163, semi-gloss.

2.05 INTERIOR PAINT SYSTEMS

A. SYSTEM I-1:

1. Substrate: Concrete Masonry Units
2. Manufacturers and Products:
 - a. Sherwin Williams:
 - 1) 1st Coat:S-W PrepRite® Block Filler, B25W25
 - 2) 2nd Coat:S-W ProMar® 200 Latex Flat
 - 3) 3rd Coat:S-W ProMar® 200 Latex Flat
 - b. Benjamin Moore:
 - 1) 1st Coat:Moore 160 Super Spec Latex Block Filler
 - 2) 2nd Coat:333 Regal AquaGlo Acrylic Flat Enamel
 - 3) 3rd Coat:333 Regal AquaGlo Acrylic Flat Enamel
 - c. Glidden Professional:
 - 1) 1st Coat:Glidden Professional Block Filler 3010 primer
 - 2) 2nd Coat:Glidden Professional Diamond 450 Flat
 - 3) 3rd Coat:Glidden Professional Diamond 450 Flat

B. SYSTEM I-2

1. Substrate: Concrete Masonry Units (Epoxy paint, Semi-gloss finish)
2. Manufacturers and Products:
 - a. Sherwin Williams:
 - 1) 1st Coat:S-W Heavy Duty Block Filler, B42W46
 - 2) 2nd Coat:S-W Pro Industrial HB/ Waterbased Epoxy, B71W111/B71W100 Series
 - 3) 3rd Coat:S-W Pro Industrial HB/ Waterbased Epoxy, B71W111/B71W100 Series
 - b. Benjamin Moore:
 - 1) 1st Coat: Super Spec HP Waterborne Epoxy Block Filler P31
 - 2) 2nd Coat:Super Spec HP Acrylic Epoxy Coating P43
 - 3) 3rd Coat:Super Spec HP Acrylic Epoxy Coating P43
 - c. Glidden Professional:
 - 1) 1st Coat:Tru-Glaze 4015 Block Filler
 - 2) 2nd Coat:Tru-Glaze WB 4426 Water-Based Epoxy
 - 3) 3rd Coat:Tru-Glaze WB 4426 Water-Based Epoxy

C. SYSTEM I-3

1. Substrate: Structural Steel and Metal Fabrications:
2. Finish: Semi-Gloss.
3. Manufacturers and Products:

- a. Sherwin Williams:
 - 1) 1st Coat:S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series
 - 2) 2nd Coat: S-W ProMar® 200 Latex Flat
 - 3) 3rd Coat:S-W ProMar® 200 Latex Flat
 - b. Benjamin Moore:
 - 1) 1st Coat: Moore P04 Super Spec HP Acrylic Metal Primer
 - 2) 2nd Coat:N333 Regal AquaGlo Acrylic Flat Enamel
 - 3) 3rd Coat: N333 Regal AquaGlo Acrylic Flat Enamel
 - c. Glidden Professional:
 - 1) 1st Coat: Devoe Coatings DEVFLEX Direct-to-Metal 4020 primer
 - 2) 2nd Coat:Glidden Professional Diamond 450 Flat
 - 3) 3rd Coat:Glidden Professional Diamond 450 Flat
- D. SYSTEM I-4
1. Substrate: Hollow metal door frames:
 2. Finish: Gloss.
 3. Manufacturers and Products:
 - a. Sherwin Williams:
 - 1) 1st Coat: DTM Acrylic Primer/Finish, B66W1
 - 2) 2nd Coat:DTM Acrylic Gloss Coating, B66W100
 - 3) 3rd Coat: DTM Acrylic Gloss Coating, B66W100
 - b. Benjamin Moore:
 - 1) 1st Coat: Moorcraft Super Spec DTM Alkyd Satin, Z163
 - 2) 2nd Coat:Moorcraft Super Spec Urethane Gloss Enamel, Z22
 - 3) 3rd Coat: Moorcraft Super Spec Urethane Gloss Enamel, Z22
 - c. Glidden Professional:
 - 1) 1st Coat: DEVGUARD 4360 Low VOC Universal Primer
 - 2) 2nd Coat:DEVGUARD 4309 Rust Preventative Gloss Enamel
 - 3) 3rd Coat: DEVGUARD 4309 Rust Preventative Gloss Enamel
- E. SYSTEM I-5
1. Substrate: Galvanized Metal, Not Chromate Passivated:
 2. Applications include but are not limited to doors, frames, railings, and exposed ductwork.
 3. Manufacturers and Products:
 - a. Sherwin Williams:
 - 1) 1st Coat:S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series
 - 2) 2nd Coat:S-W ProMar® 200 Latex Flat
 - 3) 3rd Coat:S-W ProMar® 200 Latex Flat
 - b. Benjamin Moore:
 - 1) 1st Coat: Moore P04 Super Spec HP Acrylic Metal Primer
 - 2) 2nd Coat:N333 Regal AquaGlo Acrylic Flat Enamel
 - 3) 3rd Coat:N333 Regal AquaGlo Acrylic Flat Enamel
 - c. Glidden Professional:
 - 1) 1st Coat: Devoe Coatings DEVFLEX Direct-to-Metal 4020 primer
 - 2) 2nd Coat:Glidden Professional Diamond 450 Flat
 - 3) 3rd Coat:Glidden Professional Diamond 450 Flat
- F. SYSTEM I-7
1. Substrate: Wood Floors and Stairs (Transparent Finish):
 2. Manufacturers and Products:
 - a. Sherwin Williams:

- 1) 1st Coat:Minwax 250 Wood Finish Stain
 - 2) 2nd Coat:Minwax High Build Polyurethane Varnish
 - 3) 3rd Coat:Minwax High Build Polyurethane Varnish
 - b. Benjamin Moore:
 - 1) 1st Coat: Penetrating Oil Stain
 - 2) 2nd Coat:Permathane Satin Urethane
 - 3) 3rd Coat:Permathane Satin Urethane
 - c. Glidden Professional:
 - 1) 1st Coat:1700 Wood Pride Oil-Based Wood Stain
 - 2) 2nd Coat:1902 Wood Pride Polyurethane Satin Varnish
 - 3) 3rd Coat:1902 Wood Pride Polyurethane Satin Varnish
- G. SYSTEM I-8
1. Substrate: Wood Stage (Opaque Finish):
 2. Refer to Section 09 64 29 - Stage Flooring.
- H. SYSTEM I-9
1. Substrate: Gypsum Board (Satin Finish):
 2. Applications include but are not limited to walls, ceilings, soffits, and bulkheads.
 3. Manufacturers and Products:
 - a. Sherwin Williams:
 - 1) 1st Coat:S-W PrepRite 200 Int. Latex Primer, B28 Series
 - 2) 2nd Coat:S-W ProMar® 200 Latex Eggshell, B20Series
 - 3) 3rd Coat:S-W ProMar® 200 Latex Semi-Gloss, B31Series
 - b. Benjamin Moore:
 - 1) 1st Coat: Moore P04 Super Spec HP Acrylic Metal Primer
 - 2) 2nd Coat:N319 Regal Acrylic Latex Eggshell Finish Enamel
 - 3) 3rd Coat:N319 Regal Acrylic Latex Eggshell Finish Enamel
 - c. Glidden Professional:
 - 1) 1st Coat: Glidden Professional High Hide 1000 primer
 - 2) 2nd Coat:Glidden Professional Diamond 450 7300 topcoat
 - 3) 3rd Coat:Glidden Professional Diamond 450 7300 topcoat
- I. SYSTEM I-10
1. Substrate: Painted Gypsum Board (Clear Write and Erase Finish):
 2. Manufacturers and Products:
 - a. Basis of Design: Product specified is “Wink” as manufactured by Master Coating Technologies. Items specified are to establish a standard of quality for design, function, materials, and appearance. Equivalent products by other manufacturers are acceptable.
 - 1) Colors Available: Clear
 - 2) Coverage Rate: approximately 100 square feet of surface area
 - 3) Finish: Gloss 92 at a 60 degree
 - 4) Maximum VOC: Less than 50 grams per liter, EPA Test Method 27
 - 5) Fire Rating: Class A or Class I, ASTM E 84
 - 6) Scrub Resistance: 10,000+ scrub cycles, ASTM D 2486
 - 7) Stain Removal: Excellent rating.
 - b. Coating is applied to gypsum board walls finished with System I-9.
- J. SYSTEM I-11
1. Substrate: Concrete Floor (Sealed):
 2. Manufacturers and Products:
 - a. W. R. Meadows:

1) 1st Coat:CS-309/30 Concrete Curing and Sealing Compound

PART 3 EXECUTION

3.01 SCOPE -- SURFACES TO BE FINISHED

- A. Paint all exposed surfaces except where indicated not to be painted or to remain natural; the term "exposed" includes areas visible through permanent and built-in fixtures when they are in place.
- B. Paint the surfaces described in PART 2, indicated on the Drawings, and as follows:
 - 1. If a surface, material, or item is not specifically mentioned, paint in the same manner as similar surfaces, materials, or items, regardless of whether colors are indicated or not.
 - 2. Paint surfaces behind movable equipment and furnishings the same as similar exposed surfaces.
 - 3. Paint surfaces to be concealed behind permanently installed fixtures, equipment, and furnishings, using primer only, prior to installation of the permanent item.
 - 4. Paint back sides of access panels and removable and hinged covers to match exposed surfaces.
 - 5. Finish top, bottom, and side edges of exterior doors the same as exposed faces.
 - 6. 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, unless otherwise indicated.
 - 7. Paint shop-primed mechanical and electrical items occurring in finished areas.
 - 8. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
 - 9. Paint interior surfaces of air ducts and convector and baseboard heating cabinets with flat, nonspecular black paint where visible through registers, grilles, or louvers.
 - 10. Paint dampers exposed behind louvers, grilles, to match face panels.
 - 11. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
- C. Do Not Paint or Finish the Following Items:
 - 1. Items fully factory-finished unless specifically noted; factory-primed items are not considered factory-finished.
 - 2. Items indicated to receive other finish.
 - 3. Items indicated to remain naturally finished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Anodized aluminum.
 - 6. Polished and brushed stainless steel items.
 - 7. Brick, precast concrete, integrally colored plaster.
 - 8. Polished and brushed stainless steel, anodized aluminum, bronze, terne, and lead.
 - 9. Acoustical materials.
 - 10. Concealed piping, ductwork, and conduit.

3.02 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; report incompatible primer conditions and submit recommended changes for Architect's approval.

- 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. Plaster and Gypsum Board: 12 percent.
 - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 - 3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
 - 4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
- E. Measure the ph factor of concrete, masonry, and mortar before starting any finishing process, using the method specified in MPI Architectural Painting Manual.
 - 1. Report results in writing to Architect before starting work.
 - 2. If results of test indicates need for remedial action, provide written description of remedial action. If a different primer or paint systems is required, state the total cost of the change. Do not proceed with remedial action or change without receiving written authorization from Architect.

3.03 PREPARATION

- A. Prepare surfaces as specified in MPI Architectural Painting Specification Manual and as follows for the applicable surface and coating; if multiple preparation treatments are specified, use as many as necessary for best results; where the Manual references external standards for preparation (e.g. SSPC standards), prepare as specified in those standards; comply with coating manufacturer's specific preparation methods or treatments, if any.
- B. Coordinate painting work with cleaning and preparation work so that dust and other contaminants do not fall on newly painted, wet surfaces.
- C. Surface Appurtenances: Prior to preparing surfaces or finishing, remove electrical plates, hardware, light fixtures, light fixture trim, escutcheons, machined surfaces, fittings, and similar items already installed that are not to be painted.
 - 1. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before preparation and finishing.
 - 2. After completing painting in each space or area, reinstall items removed using workers skilled in the trades involved.
- D. Surfaces: Correct defects and clean surfaces which affect work of this section.
- E. Marks: Seal with shellac those which may bleed through surface finishes.
- F. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete, Cement Plaster 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. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- J. 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 hand 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.

- K. 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.
- L. Interior Wood Items to Receive Transparent Finish: Sand wood to obtain a uniform appearance before immediately starting work. 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.
- M. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.04 APPLICATION

- A. Apply products in accordance with manufacturer's instructions and as specified or recommended by MPI Manual, using the preparation, products, sheens, textures, and colors as indicated.
 - 1. Remove, refinish, or repaint work not complying with requirements.
- B. Do not apply finishes over dirt, rust, scale, grease, moisture, scuffed surfaces, or other conditions detrimental to formation of a durable coating film; do not apply finishes to surfaces that are not dry.
- C. Use applicators and methods best suited for substrate and type of material being applied and according to manufacturer's instructions.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate; provide total dry film thickness of entire system as recommended by manufacturer.
 - 1. Number of coats and film thickness required are the same regardless of application method.
 - 2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.
 - 3. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.
- E. Apply finish to completely cover surfaces with uniform appearance without brush marks, runs, sags, laps, ropiness, holidays, spotting, cloudiness, or other surface imperfections.
 - 1. Before applying finish coats, apply a prime coat of material recommended by manufacturer, unless the surface has been prime coated by others; where evidence of suction spots or unsealed areas in first coat appear, recoat primed and sealed surfaces to ensure finish coat with no burn through or other defects due to insufficient sealing.
 - 2. Apply first coat to surface that has been cleaned, pretreated, or otherwise prepared as soon as practical after preparation and before subsequent surface deterioration.
 - 3. Do not apply succeeding coats until the previous coat has cured as recommended by manufacturer.
 - 4. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat will not cause the undercoat to lift or lose adhesion.
 - 5. If manufacturer's instructions recommend sanding to produce a smooth, even surface, sand between coats.
 - 6. Before applying next coat vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
 - 7. Pigmented (Opaque) Finishes: Provide smooth, opaque surface of uniform finish, color, appearance, and coverage.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.
- B. Owner will provide field inspection.

3.06 CLEANING AND PROTECTION

- A. Collect waste material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from site.
- C. Protect other work, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting as approved by Architect.
- D. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
- E. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in MPI Manual.

END OF SECTION

SECTION 10 11 01
VISUAL DISPLAY BOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Markerboards and Tackboards.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Blocking and supports.
- B. Section 09 21 16 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

1.03 REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard; 2009.
- B. ASTM A424 - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2009a.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data on markerboard, tackboard, tackboard surface covering, trim, and accessories.
- C. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.
- D. Samples: Submit two samples 2 by 2 inch in size illustrating materials and finish, color and texture of markerboard, tackboard, tackboard surfacing, and trim.
- E. Maintenance Data: Include data on regular cleaning, stain removal .

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 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 MANUFACTURERS

- A. Visual Display Boards:
 - 1. Claridge Products and Equipment, Inc: www.claridgeproducts.com.
 - 2. Polyvision Corporation (Nelson Adams): www.polyvision.com.
 - 3. Aarco Products, Inc. .
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 VISUAL DISPLAY BOARDS

- A. Markerboards: Porcelain enamel on steel, laminated to core.
 - 1. Color: White.
 - 2. Metal Face Sheet Thickness: 0.024 inch (24 gage).
 - 3. Core: Particleboard, manufacturer's standard thickness, laminated to face sheet.
 - 4. Backing: Aluminum foil, laminated to core.

5. Size: As indicated on drawings.
 6. Frame: Extruded aluminum, with concealed fasteners.
 7. Frame Finish: Anodized, natural.
 8. Accessories: Provide chalk tray and map rail.
- B. Tackboards: Fine-grained, homogeneous natural cork.
1. Cork Thickness: 1/8 inch.
 2. Backing: Fiberboard, 3/8 inch thick, laminated to tack surface.
 3. Size: As indicated on drawings.
 4. Frame: Same type and finish as for chalkboard.
- C. Combination Units and Units Made of More Than One Panel: Factory-assembled markerboards in a single frame, of materials specified above.
1. Configuration: As indicated on drawings.

2.03 MATERIALS

- A. Porcelain Enameled Steel Sheet: ASTM A424, Type I, Commercial Steel, with fired-on vitreous finish.
- B. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.
- C. Foil Backing: Aluminum foil sheet, 0.005 inch thick.
- D. Adhesives: Type used by manufacturer.

2.04 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. Cleaning Instruction Plate: Provide instructions for chalkboard cleaning on a metal plate fastened to perimeter frame near chalkrail.
- C. Chalk Tray: Aluminum, manufacturer's standard profile one piece full length of chalkboard, molded ends; concealed fasteners, same finish as frame.
- D. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install boards in accordance with manufacturer's instructions.
- B. Secure units level and plumb.

3.02 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.

3.03 SCHEDULE

- A. Typical Classrooms: MB-1 typical markerboard, sizes as shown.

END OF SECTION

SECTION 10 28 00
TOILET ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Accessories for toilet rooms.
- C. Grab bars.

1.02 RELATED REQUIREMENTS

- A. Section 10 21 13.19 - Solid Composite Toilet Compartments.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.
- B. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2010.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.
- E. ASTM C1036 - Standard Specification for Flat Glass; 2011e1.
- F. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Products listed are made by Bobrick and Bradley Corporation.
- B. Other Acceptable Manufacturers:
 - 1. A & J Washroom Accessories Inc: www.ajwashroom.com.
 - 2. American Specialties, Inc: www.americanspecialties.com.
 - 3. Substitutions: Section 01 60 00 - Product Requirements.
- C. All items of each type to be made by the same 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.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
- B. Stainless Steel Sheet: ASTM A666, Type 304.

- C. Stainless Steel Tubing: ASTM A269, Type 304 or 316.
- D. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- E. Mirror Glass: Float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- F. Adhesive: Two component epoxy type, waterproof.
- G. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, security type.
- H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

- A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.
- B. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.
- C. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.

2.04 TOILET ROOM ACCESSORIES

- A. Toilet Paper Dispenser: Jumbo Roll Dispenser
 - 1. Product: San-Jamar Model No. R4000TBK.
- B. Not Used
- C. Paper Towel Dispenser: Folded paper type, Black Pearl ABS cover, surface-mounted, .
 - 1. Product: T1490TBK manufactured by San-Jamar.
- D. Not Used
- E. Waste Receptacle:
 - 1. Product: Floor Type, Model # 3546 manufactured by Rubbermaid.
- F. Soap Dispenser: Soap dispenser, wall-mounted, surface, with black ABS cover .
 - 1. Product: #S890TBK manufactured by San-Jamar.
- G. Mirrors: Stainless steel framed, 6 mm thick laminated glass mirror.
 - 1. Series B- 290 manufactured by Bobrick.
 - 2. Size: 18 x 30 inches and 24 x 60 inches, as shown.
 - 3. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
 - 4. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
- H. Grab Bars: Stainless steel, 1-1/2 inches outside diameter, minimum 0.05 inch wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar.
 - 1. Length and configuration: As indicated on drawings.
 - 2. Product: B-6806 Series manufactured by Bobrick.
- I. Not Used
- J. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
 - 1. Product: B-254 manufactured by Bobrick.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings

END OF SECTION

SECTION 10 51 13

LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Open front locker units with storage compartments.
- C. Standard knocked-down metal lockers.
- D. Metal tops and filler panels.
- E. Locker benches.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Wood base construction.
- B. Section 06 20 00 - Finish Carpentry: Finish top and end panels.

1.03 REFERENCE STANDARDS

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Lockers:
 - 1. Penco Products, Inc: www.pencoproducts.com.
 - 2. Wenger; Product Gear Boss Wood Locker.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LOCKER UNITS - TYPE 1

- A. Basis fo Design: Gear Boss Wood Locker by Wenger
- B. Width: 24 inches.
- C. Depth: 24 inches.
- D. Height: 78 inches.
- E. Configuration: double.
- F. Mounting: Surface mounted.
- G. Base: Fabricate for wood base.
 - 1. Base Height: 4 inch.
- H. Locking: Equipped for padlock hasps.
- I. Form recess for operating handle and locking device.
- J. Provide end panels and filler strips.

2.03 LOCKER UNITS - TYPE 2 (ADA)

- A. Basis of Design: Gear Boss Wood Locker by Wenger.
- B. Width: 24 inches.
- C. Depth: 24 inches.
- D. Height: 78 inches.
- E. Configuration: single.

- F. Mounting: Surface mounted.
- G. Base: Fabricate for wood base.
 - 1. Base Height: 4 inch.
- H. Locking: Equipped for padlock hasps.
- I. Form recess for operating handle and locking device.
- J. Provide end panels and filler strips.

2.04 LOCKER UNITS - TYPE 3

- A. Basis of Design: Vanguard by Penco.
- B. Width: 12 inches.
- C. Depth: 12 inches.
- D. Height: 78 inches.
- E. Configuration: triple tier.
- F. Mounting: Surface mounted.
- G. Base: Metal base.
 - 1. Base Height: 6 inch.
- H. Locking: Equipped for padlock hasps.
- I. Ventilation Method: Door louvers.
- J. Class: Conventional.
- K. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.
- L. Frames: Formed channel shape, welded and ground flush, welded to body.
- M. Doors: Hollow channel edge construction, 1-3/16 inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.
- N. Hinges: Two for doors under 42 inches high; three for doors over 42 inches high; weld securely to locker body and door.
- O. Number Plates: Provide rectangular shaped aluminum plates. Form numbers 3/4 inch high of block font style with ADA designation, in contrasting color.
- P. Provide ventilation openings at top and bottom of each locker.
- Q. Form recess for operating handle and locking device.
- R. Finish edges smooth without burrs.
- S. Fabricate metal tops, ends and closure pieces.
- T. Provide end panels and filler strips.

2.05 FINISHES - WOOD LOCKERS

- A. Antimicrobial polyester laminated finish.
- B. Color: Selected from manufacturer's standard color palette.

2.06 FINISHING - METAL LOCKERS

- A. Clean, degrease, and neutralize metal; prime and finish with one coat of baked enamel.
- B. Paint locker units to be selected from manufacturer's standard color palette.

2.07 BENCHES

- A. ADA Bench: 42 inch long select hardwood seat with clear lacquer finish, 20 inches wide by 1.25 inch thick with four heavy duty steel tube legs with flanges top and bottom, anchored to the floor.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.
- B. Verify bases are properly sized.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install lockers plumb and square.
- C. Place and secure on prepared base.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 lb.
- E. Bolt adjoining locker units together to provide rigid installation.
- F. Install end panels, filler panels, and sloped tops.
- G. Install accessories.
- H. Replace components that do not operate smoothly.

3.03 CLEANING

- A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 116113 - ACOUSTICAL SHELL SYSTEM

1.00 GENERAL

1.01 SCOPE

- A. Intent: This specification covers the fabrication, furnishing, delivery, and installation of A complete Acoustical Shell System for the Auditorium Stage. The form of the contract, general conditions, and the project drawings are considered to be part of these specifications.
- B. General: Provide all items and work necessary for complete, safe, fully functional systems as specified, including:
1. Tools, scaffolding, equipment, labor and supervision, even though they may not be specifically enumerated.
 2. Verification of dimensions and conditions at the job site.
 3. Coordination of the work of this section with Division 11 Stage Rigging and Division 26 Stage Lighting systems, and other building systems whether under this contract or performed under a separate, prime contract.
 4. Notification to the Architect/Engineer of any conditions, measurements, quantities, or other data, as required for proper execution, fit and completion of all work, and for safe and proper operating clearances.
 5. Shipment of equipment to job site and the secured storage of all non-fixed equipment.
 6. Installation and completion, in accordance with these Specifications, related Drawings, the Equipment Manufacturer's recommendations, established trade criteria, and all applicable code requirements.
 7. Inspection, demonstration, and necessary adjustment of the completed installation by the Contractor's installation personnel.
 8. Preparation and submission of complete record drawings and operational and maintenance data and certificates.
 9. A one year inspection by the Contractor.
- C. Definitions: For this project, the following entities are referenced:
1. Owner: Red Clay School District, Wilmington, DE
 2. Architect: ABHA Architects, Wilmington, DE
 3. Theatre Consultant: Scheu Consulting Services, Inc., Chittenango, NY

- D. Errors and Omissions: Any errors, omissions, or ambiguities found in these documents do not relieve the Contractor of the responsibility of providing all items necessary for complete, safe, fully functional systems. Any errors, omissions, or ambiguities shall be brought to the attention of the Architect/Engineer of Record, Construction Manager, Owner, and/or Theater Consultant for clarification.
- E. Work Included: The work of this section shall include, but not be limited to the following:
1. Provide a complete system of acoustical shell ceilings and towers, as specified herein and as shown on the drawings.
 2. Coordinate design and installation of Acoustical Shell Ceilings Systems with the Division 11 Stage Rigging Contractor.
 3. Coordinate integral concert shell ceiling lighting distribution, brackets, and stage lighting cable handling system with the Division 11 Stage Rigging Contractor, and the Division 26 Electrical and Stage Lighting Contractor.

1.02 GENERAL REQUIREMENTS

- A. Field Conditions: This project is the provision and installation of new systems within a new venue. All bidders shall fully inform themselves of the conditions under which the work is to be performed. No additional compensation or time extension shall be given for conditions of which bidder could have been fully aware prior to bid.
- B. Safety: The systems shall conform to all applicable code requirements and shall be provided and installed in conformance to industry standards of operation and practices. All materials, arrangements, and procedures shall comply with applicable code requirements, allowing the end user to arrange and operate a safe assembly and working environment for audience and user's personnel.
- C. Insurance: In the absence of more stringent requirements, the Contractor shall maintain sufficient injury and property liability insurance coverage throughout the project's scheduled timetable, including workmen's compensation coverage for the Contractor's employees.

1.03 INSTALLING CONTRACTOR QUALIFICATIONS

- A. All equipment and installation shall be the responsibility of a single contractor who shall own and operate a full-time, staffed shop for the fabrication and/or assembly of stage equipment. This Contractor shall assume complete responsibility for the design, fabrication, transportation, and installation of the work in this Section, and shall hold the Owner, Architect, Theater Consultant, and all their Employees and Consultants harmless for any costs for errors or omissions associated with the work of this Section and any action arising there from.
- B. The Contractor shall have at least ten (10) years' experience in the installation of similar equipment and systems for professional and educational theaters. If requested, the Contractor shall submit a representative list of professional theater installations.

1.04 SUBMISSIONS

A. Drawings:

1. Submit plans, elevations, sections, and equipment schedules to the Architect of all systems, components, installation methods, and schedules showing all information necessary to fully explain the design features, appearance, function, fabrication, load ratings, installation and use of system components in all phases of operation.
2. The drawings shall be no less detailed than as provided in the contract documents.
3. System plans, elevations, and sections shall be submitted on minimum D-size (24x36) sheets, and shall be drawn in no less than 1/4"=1'-0" scale.
4. Submit in quantities as required by the Architect.

B. Catalog Cuts: In lieu of detailed equipment drawings, the Contractor may submit catalog cuts for standard, unmodified equipment.

1. All catalog cuts shall contain full information on dimensions, construction, applications, load ratings, etc., to permit proper evaluation.
2. Catalog cuts shall be properly identified as to their intended use. Any options or variations shall be clearly noted.
3. Detailed drawings of any modified standard equipment shall be submitted for approval as described in Section 1.04.A.
4. Catalog cut sheets shall be prepared and bound in a professional manner, with each sheet properly indexed to a "Table of Contents". Loose or stapled sheet sets are not permitted.
5. All copies of catalog cut sheets must be clear and legible.
6. Submit in quantities as required by the Architect.

C. Samples: Provide samples of all fabrics and color choices for selection and approval. Hardware or component samples shall be provided upon written request. Submit in quantities as required by the Architect

D. Approvals: All submissions must be approved per the requirements of the project's general conditions prior to the beginning any fabrication, installation, or erection. Such approval does not relieve the Contractor of the responsibility of providing equipment in accordance with the specifications or of providing fully operational and safe systems.

1.05 WARRANTY & INSPECTIONS

- A. Warranty: The Contractor shall provide a three (3) year written guarantee against defects in materials and workmanship. Within this period, the Contractor shall provide any required maintenance or replacement within 30 days of written notification by the Owner, except for safety related items that shall be corrected within 48 hours of notification. Subsequent to the expiration of the guarantee period, the Contractor agrees to furnish repair and maintenance service, at the Owner's expense, within 30 days of request for such service.
- B. One Year Inspection: At one year after the date of final acceptance, and as part of this contract, the Contractor shall provide a comprehensive inspection of all installed systems and components. Make all adjustments as may be required by normal wear and tear. This inspection shall be scheduled directly with the Owner and shall be done at the Owner's convenience.

2.00 PRODUCTS

2.01 MANUFACTURERS

- A. Quality Statement: While the equipment specifications contained herein may be based upon the standard equipment of particular approved manufacturers, the individual component specifications are provided solely to set a minimum level of quality. Under no circumstances shall equipment of lesser quality be accepted for this project. The basis of design for this project is the "Diva" acoustical shell system as manufactured by Wenger Corp. Equal system as provided by an approved manufacturer are acceptable
- B. Approved Equipment Manufacturers: Due to the highly specialized nature of theatrical equipment, and the safety requirements of the equipment, all fabricated equipment, , and other components shall be manufactured and supplied by one or more of the following approved manufacturers:

StageRight, Inc.
495 Pioneer Parkway
Clare, MI 48617

Tel: 800-438-4499

SECOA, Inc.
8650 109th Avenue North
Champlin, MN 55316-3789

Tel: 800-328-5519
Fax: 763-506-8844

Wenger Corp
555 Park Drive
Owatonna, MN 55060

Tel: 800-493-6437
Fax: 507-455-4258

3.00 GENERAL MATERIAL REQUIREMENTS

3.01 MINIMUM STANDARDS

- A. Overhead Lifting Components and Systems: Safety factor of 8.
- B. Cable Bending Ratio: Minimum of 30 times the rope diameter.
- C. Steel: 1/5 of stress yield
- D. Maximum Fleet Angle: 2 degree

3.02 MATERIALS

- A. Aluminum Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M), 6063T alloy.
- B. Steel Tube: ASTM A 501, hot formed steel tubing.
- C. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B.
- D. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, urea formaldehyde free.
- E. Hardboard: AHA A135.4, Class 1 Tempered, urea formaldehyde free.
- F. High-Pressure Decorative Laminate: NEMA LD 3, Grade VGS, with urea formaldehyde-free adhesive.
- G. Acoustical Shell Panels
 - 1. General: Manufacturer's standard stressed-skin composite acoustical shell panels, with a minimum of STC 23 to meet performance requirements, designed to mix and blend sound and reflect a maximum range of audible frequencies to both audience and performers.
 - 2. Core; 1 1/2" thick (38mm) honeycomb core material shall have an open geometric pattern with cell walls vertical to panel skins and defined by alternating straight and sine wave layers. Height of sine wave shall be 1/2", wall thickness shall correspond to 60 lb kraft. Bonding of core material to panel faces shall be with permanently cured urethane adhesive. Foam core materials and contact adhesives shall not be permitted.
 - 3. Face, Plastic Laminate-Faced Panel: 3/16 inch (4 mm) thick hardboard stressed skin, material and finish as indicated, with no exposed fasteners.
 - 4. Back: 3/16 inch (4 mm) thick hardboard stressed skin, painted black.
 - 5. Panel Edge Frame: Straight panel edges are reinforced with extruded aluminum edge frame.

H. Mobile Acoustical Towers:

1. Free-standing, self-supporting, movable towers for stage back and side walls. Towers consist of acoustical shell panels in rigid, diagonally-braced vertical aluminum frame with formed steel connection components, with center panel and two hinged wing panels, in nesting configuration minimizing required storage space. Wing panel on tower equipped with latching hardware and stage access door where indicated. Provide counterweighted tower base with adjustable front leveling pads concealed by removable access panel.
2. SPECIAL CONSTRUCTION: Side towers (4 each) shall be provided with removable tops as show in Contract Drawing TH-201. Provide all necessary hanging hardware (i.e. pipe clamps, chain, quick links, etc.) as required to safely remove and store the tower tops when not in use.
3. Tower Size: 10'-0" wide x heights as shown on the drawings.
4. Tower Panel Radius: 5 foot (1.52 m)
6. Tower Panel Face Finish: Plastic laminate in a pattern and color selected by the Architect from manufacturer's standard sections.
7. Trim strips between Panels: Painted black.
8. Door and Wing Panel Hardware:
 - a. Hinges: extruded from high-strength aluminum with a seamless barrel and integral attachment flange; hinge loads are carried by maintenance free, self-lubricating sintered bronze bearings which pivot on a 1/2" diameter steel pin that are designed for silent operation and requiring no replacement parts. Metal-on-metal hinges without self-lubricating materials are not acceptable.
 - b. Slide-lock mechanism, pull handle, and adjustable wing stay.
9. Stage Tower Air Transporter: Non powered, wheeled mover
- I. Adjustable Acoustical Shell Ceiling: Acoustical shell ceiling consisting of adjustable-angle acoustical shell ceiling panels supported by integral extruded aluminum truss, suspended from stage rigging pipe batten, and stored in fly-loft in vertical position.
 1. Ceiling Panel Size and Configuration: As shown on the drawings
 2. Ceiling Panel Radius: As shown on the drawings
 3. Ceiling Panel Face Finish: Plastic laminate in a pattern and color selected by the Architect from manufacturer's standard sections.
 4. Panel Hinges: Aluminum, with self-lubricating bearings that are designed for silent operation. Metal on metal hinges without self-lubricating materials are not acceptable.
- J. Integrated Lighting: The incandescent ceiling lighting fixtures shall be incorporated in the ceilings and distributed to provide uniform direct lighting at an intensity of 80-100 foot-candles measured 3-feet above the finished floor. Provide 750W ETC Source 4 PAR or equal.

- a. A properly rated tip-over switch shall protect each circuit to prevent the fixtures from being energized when the reflector is in its stored position. The tip over switch is mounted on an adjustable mechanism to allow for field calibration of the shut off angle.
- b. Provide one UL Listed connector strip or a series of plug boxes designed to interface with the cable handing system provided by the Division 11 Stage Rigging Contractor. Coordinate all requirements. Provide a six-foot pigtail with the appropriate connector at each switch location. Arrange circuits as required to maximize use of dimmer modules provided by others. See stage lighting drawings for complete circuitry information.
- c. Provide one UL Listed wireway complete with junction box for each row of ceiling panels. Coordinate j-box locations and circuit requirements with drawings.

E. Summary:

1. Towers: A total of eight (8) each side and rear wall/tower units, made up of four (4) side tower units with removable tops and two (2) doors each., and four (4) rear towers without removable tops or doors Widths and heights are as shown in the drawings.
2. Ceilings:
 - a. Row 1 – 9'-4" Deep x 45'-0" Wide, +/-12 degree tapered ends, 10 hanger points, 12 light fixtures
 - b. Row 2 – 9'-4" Deep x 41'-10" Wide, +/-12 degree tapered ends, 10 hanger points, 12 light fixtures
3. Hardware: One (1) each tower transport cart.

4.00 EXECUTION

4.01 INSTALLATION

- A. Storage: The Contractor shall be responsible for storage of stage equipment, tools, and its equipment during the period of the installation.
- B. Damage Protection: The Contractor shall take all precautions necessary to prevent damage to the stage floor, walls, and all other existing finishes during installation.
- C. Installation Personnel:
 1. All specified equipment shall be installed by fully trained superintendents and workers.
- D. Installation practices:
 1. Installation practices shall be in accordance with Federal OSHA Safety and Health Standards and all local codes. Certified welders shall perform all field welding in full compliance with the latest edition of the Structural Welding Code (ANSI/AWS D1.1) and any other applicable local and state codes and regulations.

2. Equipment shall be installed in a workmanlike manner, per plans and specifications. Equipment shall be aligned, adjusted, and trimmed for the most efficient operation, the greatest safety and for the best visual appearance.

E. Touch-Ups: All finishes which are disturbed during shipping and installation shall be touched up to match the original.

4.02 CLEANUP AND PROTECTION

A. Site Clean Up and Other Protection: The Contractor shall be responsible for all clean up related to its work, including the removal of packing materials etc. and the protection of existing surfaces or equipment. Repairs to damage caused by the Contractor to any item or surface are the sole responsibility of the Contractor.

B. Protection of Installed Equipment: The equipment described in this section is considered to be finished equipment and is to be protected during and after installation from excessive dirt and damage caused by other work.

C. Equipment Cleaning: All equipment and the areas around the equipment shall be cleaned prior to final inspection and acceptance.

5.00 INSPECTION, TESTING, AND OWNER TRAINING

A. Progress Inspections: During the installation of equipment the Contractor shall arrange for access as necessary for inspection of equipment by the Architect and/or the Consultant upon reasonable timely notice.

B. Special Testing: If specifications, the Architect, laws, ordinances, or any public authority require any work to be specially tested or approved, the Contractor shall give the Architect timely notice of its readiness for inspection, and of dates of inspections to be made by other authorities.

C. Completion Inspection and Testing:

1. Upon completing the installation of all equipment specified under this section, the Contractor shall notify the Architect, who will schedule an inspection.

2. At the time of inspection, the Contractor shall furnish sufficient workers to operate all equipment and to perform such adjustments and tests as may be required by the Architect and/or their Consultants.

3. Any equipment, which fails to meet with approval, shall be repaired or replaced with suitable equipment. If determined by the Architect, the inspection may be re-scheduled and held under the same conditions as specified herein.

4. Any additional costs incurred by the Architect their Consultants due to inspection re-scheduling because the work is incomplete or defective, shall be borne by the Contractor.

5. At the time of these inspections, no other work shall be performed in the auditorium and stage areas.
6. All temporary bracing, scaffolding, etc. shall be removed to permit full operation of, and access to, all equipment.
7. Final approval shall be withheld until all systems have been thoroughly tested and found to be in first class operating condition in every particular.
8. Upon completion and approval of the work, the Contactor shall remove all tools, excess supplies, and trash from the work areas. Any equipment supplied under this section, but not installed, shall be inventoried, cleaned, organized, and turned over to the Owner. The Contractor shall leave the stage and all work areas in a “broom clean” condition.

D. Owner Training And Manuals

1. Upon completion of the work, the Contractor shall submit detailed Operations and Maintenance Manuals including as-built shop drawings, equipment descriptions, any required certificates or warranties, and parts lists. Submit in quantities as required by the Architect.
2. Provide “hard” copies of Operations and Maintenance Manuals for the Owner, Architect/Engineer of Record and Consultants. The Contractor shall also provide CD-ROM’s of any and all CAD drawings or other electronically produced submittal items. Submit in quantities and file formats as required by the Architect.
3. The Contractor shall fully review all system and equipment manuals with operating and maintenance personnel designated by the Owner and/or Architect. The Contactor shall also demonstrate and fully explain the maintenance and safe use and operation of all systems and equipment included in this section. The Contractor shall notify the Owner, Architect, and Theater Consultant of the time and place of this training, no later than two weeks in advance.

END OF SECTION 116113

SECTION 116123 - ORCHESTRA PIT FILLER SYSTEM

1.00 GENERAL

1.01 SCOPE

- A. Intent: This specification covers the fabrication, furnishing, delivery, and installation of a complete Pit Filler System for the Auditorium Stage. The form of the contract, general conditions, and the project drawings are considered to be part of these specifications.
- B. General: Provide all items and work necessary for complete, safe, fully functional systems as specified, including:
1. Tools, scaffolding, equipment, labor and supervision, even though they may not be specifically enumerated.
 2. Verification of dimensions and conditions at the job site.
 3. Coordination of the work of this section with stage rigging and lighting systems, and other building systems whether under this contract or performed under a separate, prime contract.
 4. Notification to the Architect/Engineer of any conditions, measurements, quantities, or other data, as required for proper execution, fit and completion of all work, and for safe and proper operating clearances.
 5. Shipment of equipment to job site and the secured storage of all non-fixed equipment.
 6. Installation and completion, in accordance with these Specifications, related Drawings, the Equipment Manufacturer's recommendations, established trade criteria, and all applicable code requirements.
 7. Inspection, demonstration, and necessary adjustment of the completed installation by the Contractor's installation personnel.
 8. Preparation and submission of complete record drawings and operational and maintenance data and certificates.
 9. A one year inspection by the Contractor.
- C. Definitions: For this project, the following entities are referenced:
1. Owner: Red Clay School District, Wilmington, DE
 2. Architect: ABHA Architects, Wilmington, DE
 3. Theatre Consultant: Scheu Consulting Services, Inc., Chittenango, NY
- D. Errors and Omissions: Any errors, omissions, or ambiguities found in these documents do not relieve the Contractor of the responsibility of providing all items necessary for complete,

safe, fully functional systems. Any errors, omissions, or ambiguities shall be brought to the attention of the Architect/Engineer of Record, Construction Manager, Owner, and/or Theater Consultant for clarification.

- E. Work Included: The work of this section shall include, but not be limited to the following:
1. Provide portable platforms that comprise the orchestra pit filler system in quantities and arrangements as shown on in the drawings. Platforms shall be designed to work in three configurations:
 - a. A functioning level at stage height.
 - b. A functioning level midway between stage height and audience floor height.
 - c. A functioning level at audience floor height
 2. Provide all hard /pit closure/facia panels as specified herein & shown on the drawings.
 3. The Installation Contractor shall provide for the demonstration of the setup and breakdown of the orchestra pit filler.
 4. The Installation Contractor shall provide the systems manuals.
 5. The Installation Contractor shall provide the systems warranty..

1.02 GENERAL REQUIREMENTS

- A. Field Conditions: This project is the provision and installation of new systems within a new venue. All bidders shall fully inform themselves of the conditions under which the work is to be performed. No additional compensation or time extension will be given for conditions of which bidder could have been fully aware prior to bid.
- B. Safety: The systems shall conform to all applicable code requirements and shall be provided and installed in conformance to industry standards of operation and practices. All materials, arrangements, and procedures shall comply with applicable code requirements, allowing the end user to arrange and operate a safe assembly and working environment for audience and user's personnel.
- C. Insurance: In the absence of more stringent requirements, the Contractor shall maintain sufficient injury and property liability insurance coverage throughout the project's scheduled timetable, including workmen's compensation coverage for the Contractor's employees.

1.03 INSTALLING CONTRACTOR QUALIFICATIONS

- A. All equipment and installation shall be the responsibility of a single contractor who shall own and operate a full-time, staffed shop for the fabrication and/or assembly of stage equipment. This Contractor shall assume complete responsibility for the design, fabrication, transportation, and installation of the work in this Section, and shall hold the Owner, Architect, Theater Consultant, and all their Employees and Consultants harmless for any costs for errors or omissions associated with the work of this Section and any action arising there from.

- B. The Contractor shall have at least ten (10) years' experience in the installation of similar equipment and systems for professional and educational theaters. If requested, the Contractor shall submit a representative list of professional theater installations.
- C. The Contractor shall be a member in good standing of the Production Lighting and Sound Association (PLASA) and maintain qualifying membership for the duration of the project.

1.04 SUBMISSIONS

A. Drawings:

- 1. Submit plans, elevations, sections, and equipment schedules to the Architect of all systems, components, installation methods, and schedules showing all information necessary to fully explain the design features, appearance, function, fabrication, load ratings, installation and use of system components in all phases of operation.
- 2. The drawings shall be no less detailed than as provided in the contract documents.
- 3. System plans, elevations, and sections shall be submitted on minimum D-size (24x36) sheets, and shall be drawn in no less than 1/4"=1'-0" scale.
- 4. Submit in quantities as required by the Architect.

B. Catalog Cuts: In lieu of detailed equipment drawings, the Contractor may submit catalog cuts for standard, unmodified equipment.

- 1. All catalog cuts shall contain full information on dimensions, construction, applications, load ratings, etc., to permit proper evaluation.
- 2. Catalog cuts shall be properly identified as to their intended use. Any options or variations shall be clearly noted.
- 3. Detailed drawings of any modified standard equipment shall be submitted for approval as described in Section 1.04.A.
- 4. Catalog cut sheets shall be prepared and bound in a professional manner, with each sheet properly indexed to a "Table of Contents". Loose or stapled sheet sets are not permitted.
- 5. All copies of catalog cut sheets must be clear and legible.
- 6. Submit in quantities as required by the Architect.

C. Samples: Provide samples of all fabrics and color choices for selection and approval. Hardware or component samples shall be provided upon written request. Submit in quantities as required by the Architect

- D. Approvals: All submissions must be approved per the requirements of the project's general conditions prior to the beginning any fabrication, installation, or erection. Such approval does not relieve the Contractor of the responsibility of providing equipment in accordance with the specifications or of providing fully operational and safe systems.

1.05 WARRANTY & INSPECTIONS

- A. Warranty: The Contractor shall provide a three (3) year written guarantee against defects in materials and workmanship. Within this period, the Contractor shall provide any required maintenance or replacement within 30 days of written notification by the Owner, except for safety related items that shall be corrected within 48 hours of notification. Subsequent to the expiration of the guarantee period, the Contractor agrees to furnish repair and maintenance service, at the Owner's expense, within 30 days of request for such service.
- B. One Year Inspection: At one year after the date of final acceptance, and as part of this contract, the Contractor shall provide a comprehensive inspection of all installed systems and components. Make all adjustments as may be required by normal wear and tear. This inspection shall be scheduled directly with the Owner and shall be done at the Owner's convenience.

2.00 PRODUCTS

2.01 MANUFACTURERS

- A. Quality Statement: While the equipment specifications contained herein may be based upon the standard equipment of particular approved manufacturers, the individual component specifications are provided solely to set a minimum level of quality. Under no circumstances will equipment of lesser quality be accepted for this project.
- B. Approved Equipment Manufacturers: Due to the highly specialized nature of theatrical rigging and related equipment, and the safety requirements of the equipment, all fabricated equipment and other components shall be manufactured and supplied by one or more of the following approved manufacturers, or approved equals:

Staging Concepts, Inc. Tel: 800-337-5339
7008 Northland Drive, Suite 150
Brooklyn Park, MN 55428

StageRight, Inc. Tel: 800-438-4499
495 Pioneer Parkway
Clare, MI 48617

SECOA, Inc. Tel: 800-328-5519
8650 109th Avenue North Fax: 763-506-8844
Champlin, MN 55316-3789

Wenger Corp
555 Park Drive
Owatonna, MN 55060

Tel: 800-493-6437
Fax: 507-455-4258

3.00 PRODUCTS

3.01 GENERAL REQUIREMENTS

- A. All materials and equipment shall be furnished in the quantities needed to complete the scope of work.
- B. All materials and equipment used in this project shall be new, unused and of the latest models and design. Refurbished materials and equipment are not permitted.
- C. Any electrical devices installed shall be UL listed and NEC approved.
- D. Any item of equipment or hardware that may not be specifically shown on the drawings or specified herein but required for proper system operation or installation shall be furnished and installed and be of the highest quality available.
- E. Prior to fabrication of materials, the Contractor shall visit the site and measure for the exact fit of all materials and assure himself of the appropriateness of the materials.
- F. Machining and Finishing: Operating parts of all rigging equipment shall be suitably machine finished. Tolerances, fit and finish, where not specified, shall conform with good trade practices.
- G. Where dimensions and loading capacities have been omitted from this specification, they are to be determined by the bidder in accordance with accepted industry standards and the guidelines in this section. In no way shall the Contractor be relieved of the primary responsibility to provide a safe, fully functional system.
- H. All equipment shall be built and installed to facilitate future maintenance and replacement.
- I. The mechanical fabrication and workmanship shall incorporate best practices for good fit and finish. There shall not be any burrs or sharp edges to cause a hazard nor there be any sharp corners accessible to personnel.
- J. All finishes which are disturbed during shipping and installation shall be touched up to match the original.

3.02 STANDARD MANUFACTURED COMPONENTS

- A. Decks:
 - 1. Decks shall be single sided.
 - 2. Each deck shall be 3/4 inch Plywood A/C exterior grade.
 - 3. Deck shall attach to frame utilizing zinc-plated machine screws.
 - 4. The deck surface shall be as required to match stage floor, as specified by the Architect.

5. All platform materials shall meet or exceed Class "A" fire ratings where applicable.

B. Frames:

1. Frame shall be constructed of extruded structural aluminum with mill finish. The extrusion shall be U-shaped in design for maximum strength and rigidity. The extrusion shall have edging to protect the perimeter of the deck materials. The extrusion shall have channels that allow for the attachment of accessories. Frame shall include integral aluminum brace located in center of platform mounted along the length of the longest dimension.
2. Frame shall be joined at the corners with a structural extruded aluminum leg pocket.

C. Leg Assemblies:

1. Deck units shall be no larger than 4'-0" x 8'-0" (or equivalent square footage) and/or weigh more than 100 lbs.
2. Deck units shall be provided with leg sockets to accept detachable legs.
3. The legs shall be fabricated from 1 1/4" Schedule 40 aluminum pipe, or tubing, with mill finish.
4. Each leg shall be equipped at the bottom with screw type adjustable foot with threaded rod to allow for fine adjustments to compensate for minor floor irregularities, with a minimum of 1/2" of fine height adjustment. They shall have a PUC pad on bottom of foot.
5. When necessary, lateral bracing shall be fabricated of 1 1/4" Schedule 40 aluminum pipe, or tubing, connected to structural fitting.

D. Unit to Unit Connection:

1. Individual platforms at same height elevations shall be connected by use of top locking cam-type mounted internally on the frame extrusion.
2. Steel Leg Clamps shall be used to connect adjacent platforms at unequal levels.

3.03 ACCESSORIES

- A. Provide stage edge fascia closure panels as shown on the drawings. Finish is to match architectural finish. See architectural drawings for details.
- B. Provide masking drapery for the front edge of the platform when at stage level.
 1. Material: 25 oz. Polyester IFR velour with 50% fullness, in a color as selected by the architect from manufacturer's standard selections.
 2. Front skirting to attach to the front factor of the platforms by a continuous Velcro strip.
 3. Provide storage canvas duck bags for drapery when not in use.

C. Storage Carts:

1. There is no room to store traditional carts. Provide rigid casters that set in leg sockets and secure with T-handle bolt.
2. Furnish the necessary amount of casters to fabricate a storage cart to store the entire orchestra pit filler.
3. Provide one handle for the storage cart.

4.00 EXECUTION

4.01 INSTALLATION

- A. Storage: The Contractor shall be responsible for storage of stage equipment, tools, and its equipment during the period of the installation.
- B. Damage Protection: The Stage Rigging Contactor shall take all precautions necessary to prevent damage to the stage floor, walls, and all other existing finishes during installation.
- C. Installation Personnel:
1. All specified equipment shall be installed by fully trained superintendents and workers.
- D. Installation practices:
1. Installation practices shall be in accordance with Federal OSHA Safety and Health Standards and all local codes. Certified welders shall perform any field welding in full compliance with the latest edition of the Structural Welding Code (ANSI/AWS D1.1) and any other applicable local and state codes and regulations.
 2. Equipment shall be installed in a workmanlike manner, per plans and specifications. Equipment shall be aligned, adjusted, and trimmed for the most efficient operation, the greatest safety and for the best visual appearance.
- E. Touch-Ups: All finishes which are disturbed during shipping and installation shall be touched up to match the original.

4.02 CLEANUP AND PROTECTION

- A. Site Clean Up and Other Protection: The Contractor shall be responsible for all clean up related to its work, including the removal of packing materials etc. and the protection of existing surfaces or equipment. Repairs to damage caused by the Contractor to any item or surface are the sole responsibility of the Contractor.
- B. Protection of Installed Equipment: The equipment described in this section is considered to be finished equipment and is to be protected during and after installation from excessive dirt and damage caused by other work.

- C. Equipment Cleaning: All equipment and the areas around the equipment shall be cleaned prior to final inspection and acceptance.

5.00 INSPECTION, TESTING, AND OWNER TRAINING

- A. Progress Inspections: During the installation of equipment the Contractor shall arrange for access as necessary for inspection of equipment by the Architect and/or the Consultant upon reasonable timely notice.
- B. Special Testing: If specifications, the Architect, laws, ordinances, or any public authority require any work to be specially tested or approved, the Contractor shall give the Architect timely notice of its readiness for inspection, and of dates of inspections to be made by other authorities.
- C. Completion Inspection and Testing:
 1. Upon completing the installation of all equipment specified under this section, the Contractor shall notify the Architect, who will schedule an inspection.
 2. At the time of inspection, the Contractor shall furnish sufficient workers to operate all equipment and to perform such adjustments and tests as may be required by the Architect and/or their Consultants.
 3. Any equipment, which fails to meet with approval, shall be repaired or replaced with suitable equipment. If determined by the Architect, the inspection may be re-scheduled and held under the same conditions as specified herein.
 4. Any additional costs incurred by the Architect their Consultants due to inspection re-scheduling because the work is incomplete or defective, shall be borne by the Contractor.
 5. At the time of these inspections, no other work shall be performed in the auditorium and stage areas.
 6. All temporary bracing, scaffolding, etc. shall be removed to permit full operation of, and access to, all equipment.
 7. Final approval will be withheld until all systems have been thoroughly tested and found to be in first class operating condition in every particular.
 8. Upon completion and approval of the work, the Contactor shall remove all tools, excess supplies, and trash from the work areas. Any equipment supplied under this section, but not installed, shall be inventoried, cleaned, organized, and turned over to the Owner. The Contractor shall leave the stage and all work areas in a "broom clean" condition.

D. Owner Training And Manuals

1. Upon completion of the work, the Contractor shall submit detailed Operations and Maintenance Manuals including as-built shop drawings, equipment descriptions, any required certificates or warranties, and parts lists. Submit in quantities as required by the Architect.
2. Provide “hard” copies of Operations and Maintenance Manuals for the Owner, Architect/Engineer of Record and Consultants. The Contractor shall also provide CD-ROM’s of any and all CAD drawings or other electronically produced submittal items. Submit in quantities and file formats as required by the Architect.
3. The Contractor shall fully review all system and equipment manuals with operating and maintenance personnel designated by the Owner and/or Architect. The Contractor shall also demonstrate and fully explain the maintenance and safe use and operation of all systems and equipment included in this section. The Contractor shall notify the Owner, Architect, and Theater Consultant of the time and place of this training, no later than two weeks in advance.

END OF SECTION 116133

SECTION 116133

STAGE RIGGING AND DRAPERIES

1.00 GENERAL

1.01 SCOPE

- A. Intent: This specification covers the fabrication, furnishing, delivery, provision, and installation of stage rigging, drapery track systems, stage draperies, and related equipment. The form of the contract, general conditions, and the project drawings are considered to be part of these specifications.
- B. General: Provide all items and work necessary for complete, safe, fully functional systems as specified, including:
1. Tools, scaffolding, equipment, labor and supervision, even though they may not be specifically enumerated.
 2. Verification of dimensions and conditions at the job site.
 3. Coordination of the work of this section with structural steel, sprinkler systems, HVAC systems, roof drains, conduit, and other such systems whether under this contract or performed under a separate, prime contract.
 4. Notification to the Architect/Engineer of any conditions, measurements, quantities, or other data, as required for proper execution, fit and completion of all work, and for safe and proper operating clearances.
 5. Shipment of equipment to job site and the secured storage of all non-fixed equipment.
 6. Installation and completion, in accordance with these Specifications, related Drawings, the Equipment Manufacturer's recommendations, established trade criteria, and all applicable code requirements.
 7. Inspection, demonstration, and necessary adjustment of the completed installation by the Theater Equipment Contractor's installation personnel.
 8. Preparation and submission of complete record drawings and operational and maintenance data and certificates.
 9. A one year inspection by the Theater Equipment Contractor.
- C. Definitions: For this project, the following entities are referenced:
1. Owner: Red Clay School District, Wilmington, DE
 2. Architect: ABHA Architects, Wilmington, DE
 3. Theatre Consultant: Scheu Consulting Services, Inc., Chittenango, NY

- D. Errors and Omissions: Any errors, omissions, or ambiguities found in these documents do not relieve the Theater Equipment Contractor of the responsibility of providing all items necessary for complete, safe, fully functional systems. Any errors, omissions, or ambiguities shall be brought to the attention of the Architect/Engineer of Record, Construction Manager, Owner, and/or Theater Consultant for clarification.
- E. Work Included: The work of this section shall include, but not be limited to the following:

Base Bid:

1. Provide one (1) fiberglass Fire Safety Curtain and line shaft type motorized hoist rigging system with emergency descent speed control, meeting all local code requirements, and/or as specified herein and as shown on the drawings.
2. Provide four (4) each 6 line 2,300 lb total capacity electrically operated counterweight assist hoist rigging linesets for use with the stage lighting electrics (1,350 lb of counterweight capacity plus 1,000 lb overbalance capacity. Coordinate installation of stage lighting distribution strip, distribution strip brackets, and stage lighting cable handling system. Coordinate with electrical contractor and stage lighting contractor.
3. Provide two (2) each 6 line 2,300 lb total capacity electrically operated counterweight assist hoist linesets for use with concert shell ceiling arrays. Coordinate design and installation of rigging with Concert Shell manufacturer/supplier. Coordinate installation of integral concert shell ceiling lighting distribution and stage lighting cable handling system. Coordinate with Concert Shell manufacturer/supplier, electrical contractor, and stage lighting contractor.
4. Provide one (1) each 5 line 2,300 lb total capacity electrically operated counterweight assist hoist linesets for utility use and to store Concert Shell Towers removable tops (see sheet TR-201). Coordinate design and installation of rigging with Concert Shell manufacturer/supplier.
5. Provide twenty three (23) each 5 line 1,300 lb capacity manual counterweight linesets for use with stage draperies and tracks, and utility/scenery requirements.
6. Provide nine (9) each segmented sag bar assemblies mounted to the top of the gridiron mounted loft blocks, as shown in the drawings and as specified herein
7. Provide one (1) stage level locking rail.
8. Provide one (1) two circuit index strip light and outrigger batten assembly, supported by steel brackets as required.
9. Provide a centrally located, solid state, targeting hoist control system in the backstage control panel (BSCP) rack at the downstage left proscenium wall as described herein and as shown on the drawings. Coordinate with other theatrical equipment control devices for lighting and audio located in the same rack (rack provided by stage lighting contractor).
10. Provide four (4) auditorium side torm lighting ladders. Coordinate locations and installation means and methods with general contractor, electrical contractor and stage lighting contractor.
11. Provide new stage drapery tracks, stage draperies, and stage drapery storage bags for the Auditorium Stage and Orchestra Pit as shown in the drawings and schedules.

12. Provide one (1) each horizontal lifeline fall arrest system at the loading gallery, four (4) each vertical/retractable fall arrest systems at the auditorium side torm light ladders, and at any other access ladders taller than 10'-0". Provide six (6) each full body fall arrest harnesses in sizes to be determined by the Owner.

13. Provide Owner training, manuals, and as-built drawings as described herein.

Alternate #4

1. In lieu of the seamless white FR muslin cyclorama specified herein, provide a PVC cyclorama (Gerriets "Opera" or Rosco "Twin White")

Alternate #5

1. Provide an adjustable acoustical banner system in the auditorium made up of 12 each 8'-0" wide double sided fabric banners, hoists, and control as shown in the drawings and as specified herein

1.02 GENERAL REQUIREMENTS

- A. Field Conditions: This project is the provision and installation of new stage rigging systems within an existing venue. All bidders are strongly advised to survey the locations of the work to be performed prior to bid. All bidders shall fully inform themselves of the conditions under which the work is to be performed. No additional compensation or time extension will be given for conditions of which bidder could have been fully aware prior to bid.
- B. Safety: The systems shall conform to all applicable code requirements and shall be provided and installed in conformance to industry standards of operation and practices. All materials, arrangements, and procedures shall comply with applicable code requirements, allowing the end user to arrange and operate a safe assembly and working environment for audience and user's personnel.
- C. Insurance: In the absence of more stringent requirements, the Theater Equipment Contractor shall maintain sufficient injury and property liability insurance coverage throughout the project's scheduled timetable, including workmen's compensation coverage for the Theater Equipment Contractor's employees.

1.03 THEATER EQUIPMENT CONTRACTOR QUALIFICATIONS

- A. All equipment and installation shall be the responsibility of a single contractor who shall own and operate a full-time, staffed shop for the fabrication and/or assembly of stage equipment. This Contractor shall assume complete responsibility for the design, fabrication, transportation, and installation of the work in this Section, and shall hold the Owner, Architect, Theater Consultant, and all their Employees and Consultants harmless for any costs for errors or omissions associated with the work of this Section and any action arising there from.
- B. If the Theater Equipment Contractor does not manufacture or fabricate the major components of the stage rigging systems themselves, then they shall be a manufacturer's authorized dealer and installer of that manufacturer's stage rigging equipment.

- C. The Theater Equipment Contractor shall have at least ten (10) years' experience in the installation of similar equipment and systems for professional and educational theaters. If requested, the Theater Equipment Contractor shall submit a representative list of professional theater installations.
- D. The Theater Equipment Contractor shall be a member in good standing of the Production Lighting and Sound Association (PLASA) and maintain qualifying membership for the duration of the project.
- E. The Theater Equipment Contractor's field supervisor shall be an ETCP Certified Theater Rigger in good standing for the duration of the project.
- F. Contractors not having a qualified and experienced sewing room as an integral part of their operation shall employ the services of a qualified and experienced Sewing Sub-contractor for the fabrication of stage draperies. Sewing Sub-contractor shall have at least ten (10) years experience in the fabrication of draperies for professional theaters. If requested, the Rigging Contractor shall submit a representative list of professional theater projects performed by the Sewing Sub-contractor during the above period.

1.04 SUBMISSIONS

A. Drawings:

- 1. Submit plans, elevations, sections, and equipment schedules to the Architect of all systems, components, installation methods, and schedules showing all information necessary to fully explain the design features, appearance, function, fabrication, load ratings, installation and use of system components in all phases of operation.
- 2. All drawings shall be prepared under the direct supervision of, and sealed by, a Professional Engineer licensed in the State of Delaware, and familiar with the design and installation of stage equipment.
- 3. The drawings shall be no less detailed than as provided in the contract documents.
- 4. System plans, elevations, and sections shall be submitted on minimum D-size (24x36) sheets, and shall be drawn in no less than 1/4"=1'-0" scale.
- 5. Submit in quantities as required by the Architect.

B. Catalog Cuts: In lieu of detailed equipment drawings, the Theater Equipment Contractor may submit catalog cuts for standard, unmodified equipment.

- 1. All catalog cuts shall contain full information on dimensions, construction, applications, load ratings, etc., to permit proper evaluation.
- 2. Catalog cuts shall be properly identified as to their intended use. Any options or variations shall be clearly noted.
- 3. Detailed drawings of any modified standard equipment shall be submitted for approval as described in Section 1.04.A.
- 4. Catalog cut sheets shall be prepared and bound in a professional manner, with each sheet properly indexed to a "Table of Contents". Loose or stapled sheet sets are not permitted.
- 5. All copies of catalog cut sheets must be clear and legible.

6. Submit in quantities as required by the Architect.
- C. Samples: Provide samples of all fabrics and color choices for selection and approval. Hardware or component samples shall be provided upon written request. Submit in quantities as required by the Architect
- D. Approvals: All submissions must be approved per the requirements of the project's general conditions prior to the beginning any fabrication, installation, or erection. Such approval does not relieve the Theater Equipment Contractor of the responsibility of providing equipment in accordance with the specifications or of providing fully operational and safe systems.

1.05 WARRANTY & INSPECTIONS

- A. Warranty: The Theater Equipment Contractor shall provide a three (3) year written guarantee against defects in materials and workmanship. Within this period, the Theater Equipment Contractor shall provide any required maintenance or replacement within 30 days of written notification by the Owner, except for safety related items that shall be corrected within 48 hours of notification. Subsequent to the expiration of the guarantee period, the Theater Equipment Contractor agrees to furnish repair and maintenance service, at the Owner's expense, within 30 days of request for such service.
- B. One Year Inspection: At one year after the date of final acceptance, and as part of this contract, the Theater Equipment Contractor shall provide a comprehensive inspection of all installed systems and components. Make all adjustments as may be required by normal wear and tear. This inspection shall be scheduled directly with the Owner and shall be done at the Owner's convenience.
- C. Continuing Inspections: The Theater Equipment Contractor shall offer the Owner estimated costs of a safety inspection and training program to be performed yearly. This program may include systems other than the stage rigging, such as production lighting and audio systems, as well as general backstage safety, at the discretion of the Owner and Contractor.

2.00 PRODUCTS

2.01 MANUFACTURERS

- A. Quality Statement: While the equipment specifications contained herein may be based upon the standard equipment of particular approved manufacturers, the individual component specifications are provided solely to set a minimum level of quality. Under no circumstances will equipment of lesser quality be accepted for this project.
- B. Approved Equipment Manufacturers: Due to the highly specialized nature of theatrical rigging and related equipment, and the safety requirements of the equipment, all fabricated theatrical rigging equipment, drapery tracks, stage draperies, and other components shall be manufactured and supplied by one or more of the following approved manufacturers:

Stage Rigging Equipment:

H & H Specialties, Inc. Tel: 800-221-9995
PO Box 9327 Fax: 712-200-1936
South El Monte, CA 91733

JR Clancy, Inc. Tel: 800-836-1885
7041 Interstate Island Road Fax: 315-451-1766
Syracuse, NY 13209

Daktronics Tel: 516-765-3687
201 Daktronics Dr.
Brookings, SD 57006-5128

SECOA, Inc. Tel: 800-328-5519
8650 109th Avenue North Fax: 763-506-8844
Champlin, MN 55316-3789

Texas Scenic Co., Inc. Tel: 800-292-7490
611A Lofstrand Lane Fax: 301-309-1492
Rockville, MD 20850

Thern Stage Equipment Tel: 800-553-2204
5712 Industrial Park Road Fax: 507-454-5282
Winona, MN 55987

Stage Drapery Tracks:

Automatic Devices Company Tel: 800-360-2321
2121 South 12th Fax: 610-797-4088
Allentown, PA 18103

H & H Specialties, Inc. Tel: 800-221-9995
PO Box 9327 Fax: 712-200-1936
South El Monte, CA 91733

NO OTHER MANUFACTURERS SHALL BE CONSIDERED OR APPROVED FOR
THE STAGE CURTAIN TRACKS ON THIS PROJECT.

Fall Arrest Systems:

Sapsis Rigging Company Tel: 800-727-7471
233 N. Lansdowne Ave. Fax: 800-292-3851
Lansdowne, PA 19050

DBI/Sala Tel: 800-328-6146
3833 Sala Way Fax: 651-388-5065
Red Wing, MN 55066

French Creek Productions, Inc. Tel: 877-228.9327
626 Thirteenth Street Fax: 814.437.2544
Franklin, PA 16323

Adjustable Acoustical Banner System (Alternate #6):

acouStaCorp Tel: 718-402-2677
704 E. 132nd Street
Bronx, NY 10454

JR Clancy, Inc. Tel: 800-836-1885
7041 Interstate Island Road Fax: 315-451-1766
Syracuse, NY 13209

Daktronics Tel: 516-765-3687
201 Daktronics Dr.
Brookings, SD 57006-5128

- C. Requirements for Approval: Other manufacturers seeking acceptance shall follow the procedures and requirements as outlined in the project's general conditions.

3.00 GENERAL MATERIAL REQUIREMENTS

3.01 STANDARDS

- A. Materials shall conform to the following ASTM and ANSI standard specifications:

1. A-36 Specification for structural steel
2. A-47 Specification for malleable iron castings
3. A-48 Specification for gray iron castings
4. A-120 Specification for black and hot-dipped zinc-coated galvanized steel pipe for ordinary use
5. B18.2.1&2 Specification for square and hex bolts and nuts

- B. In order to establish minimum standards of safety, the following factors shall be used:

1. Cables and Fittings 8:1 Safety factor
2. Steel 1/5 of yield
3. Bolts SAE J429 Grd 5 (ISO R898 Class 8.8) Zinc plated
4. Motors 1.0 Service Factor
5. Gearboxes 1.0 Mechanical Strength Service Factor

- C. Materials: All materials used in this project shall be new, unused, and of the latest design. Refurbished and obsolete materials are not permitted.

D. Fabrication:

1. The mechanical fabrication and workmanship shall incorporate best practices for good fit and finish. There shall be no burrs or sharp edges to cause either a hazard or present any sharp corners accessible to personnel.
2. All moving parts shall have specified tolerances.
3. All equipment shall be fabricated and installed to facilitate future maintenance and replacement.

E. Finishes:

1. Provide standard manufacturer's finishes except where noted.
2. Turnbuckles, clips, tracks, chains, and incidental hardware shall be plated or painted.

3.02 NEW STAGE RIGGING SYSTEM COMPONENTS

A. General: The following listing is provided as a general guide to the major components required for this project. It is not intended to be a complete listing of all equipment and components required to provide fully functional systems. Materials, fabrication, and installation shall be as shown in the drawings and as specified herein. The Theater Equipment Contractor is solely responsible for providing all items necessary for complete, safe, fully functional systems that meet the intent of these specifications.

B. Bills of Materials – Base Bid

1. Provide one (1) each six (6) line fiberglass Fire Safety Curtain System meeting all local code requirements, and/or as specified herein and as shown on the drawings. The system shall be made up of (but not limited to) the following components:
 - 1 ea 1,500 lb capacity electrically powered, six (6) drum lineshaft style hoist with emergency descent speed control.
 - 1 ea Up/Down/E-Stop, Hold-to-run pushbutton control, with Power On/Off key switch
 - 1 ea Fiberglass Fire Safety Curtain approx. 22'-0" H x 48'-2" W with U-shaped metal side hems and steel roller guides spaced 18" max on center
 - 1 ea Continuous "Smoke Seal" attached to the proscenium wall and located above the proscenium opening
 - 2 ea Full height (stage floor to underside of grid) steel side smoke pocket with continuous roller guide track.
 - 1 ea Manual emergency release system, located at each side of the proscenium opening, clear of any curtains.
 - 1 ea Automatic emergency release system activated by Rate-Of-Rise heat detectors located on the upper proscenium wall, or as required by local code.
 - 1 ea Automatic emergency release system activated by fusible links located in the manual release line system, or as required by local code.
 - 6 ea 1/4" lift cables
 - 7 ea 1/4" alloy safety chain assembly with attachments to the gridiron structure

- 2 ea 2" ID sched 40 pipe batten contained in pockets at the top and bottom of the Fire Safety Curtain
 - 1 ea 6" thick, continuous "Yield Pad" at the bottom of the Fire Safety Curtain
 - 1 Lot System Signage as described herein
2. Provide four (4) each 6 line 2,300 lb capacity electrically operated counterweight assist hoist rigging linesets for use with the stage lighting electrics. Coordinate installation of stage lighting distribution strip, distribution strip brackets, and stage lighting cable handling system with electrical contractor and stage lighting contractor. Each set shall be made up of (but not limited to) the following components:
- 1 ea 1,000 lb capacity electrically powered counterweight assists hoist
 - 1 ea 12" dia 6 Line Headblock
 - 1 ea 6'-0" long single purchase counterweight arbor 8" c/c
 - 6 ea Loftblock
 - 6 ea 1/4" lift cables
 - 1 lot 1/4" Trim chain assembly
 - 2 ea 1 1/2" ID sched 40 pipe batten in lengths as shown on the drawings.
NOTE: Special truss batten required for 4th Electric. See drawings for detail
 - 650 lb 6" wide steel counterweight (80% 2" thick, 20% 1" thick)
 - 1 ea Cable cradle type lighting cable handling system as shown on the drawings
3. Provide two (2) each 6 line 2,300 lb capacity electrically operated hoist rigging linesets for use with concert shell ceiling arrays. Coordinate design and installation of rigging with Concert Shell manufacturer/supplier. Coordinate installation of integral concert shell ceiling lighting distribution strips, distribution strip brackets, and stage lighting cable handling system with Concert Shell manufacturer/supplier, electrical contractor, and stage lighting contractor. Each set shall be made up of (but not limited to) the following components:
- 1 ea 1,000 lb capacity electrically powered counterweight assists hoist
 - 1 ea 12" dia 7 Line Headblock
 - 1 ea 6'-0" long single purchase counterweight arbor 8" c/c
 - 6 ea Loftblock
 - 6 ea 1/4" lift cables
 - 1 lot 1/4" Trim chain assembly
 - 1 ea 1 1/2" ID sched 40 ladder type truss pipe batten in lengths as shown on the drawings
 - As Req'd 6" wide steel counterweight (80% 2" thick, 20% 1" thick) necessary to balance the weight of the installed concert shell ceiling
 - 1 ea Cable cradle type lighting cable handling system as shown on the drawings
4. Provide one (1) each 5 line 2,300 lb capacity electrically operated, 2,300 lb total capacity electrically operated counterweight assist hoist linesets for utility use and to store Concert Shell Towers removable tops (see sheet TR-201). Coordinate design and installation of rigging with Concert Shell manufacturer/supplier. Each set shall be made up of (but not limited to) the following components:

1 ea 1,000 lb capacity electrically powered counterweight assists hoist
1 ea 12" dia 6 Line Headblock
1 ea 6'-0" long single purchase counterweight arbor 8" c/c
5 ea Loftblock
5 ea 1/4" lift cables
1 lot 1/4" Trim chain assembly
1 ea 1 1/2" ID sched 40 pipe batten in lengths as shown on the drawings
650 lb 6" wide steel counterweight (80% 2" thick, 20% 1" thick)

5. One (1) Solid state, targeting hoist control system in the backstage control panel (BSCP).
6. One (1) motorized stage rigging control pendant receptacle and remote control pendant.
7. 23 each 6 line 1,300 lb capacity single purchase manual counterweight linesets for use with stage masking draperies and scenery/utility battens. Each set shall be made up of (but not limited to) the following components:

1 ea 12" dia 6 Line Headblock
1 ea 6'-0" long single purchase counterweight arbor 8" c/c
5 ea Loftblock
1 ea 10" take-up block for 3/4" handline 8" c/c
1 ea Rope lock with 9" plastic coated handle
6 ea 1/4" lift cables
1 lot 1/4" Trim chain assembly
1 ea 1 1/2" ID sched 40 pipe batten in lengths as shown on the drawings
750 lb 6" wide steel counterweight (80% 2" thick, 20% 1" thick)

4. Nine (9) each segmented sag bar assemblies mounted to the top of the centermost gridiron mounted loftblocks, as shown in the drawings and as specified herein.
5. 41 each (full battery) or 1 1/2" aluminum T or J guides, 8" on center, +/- 43'-9" long
6. One (1) stage level locking rail +/- 26'-8" long, 8" c/c
7. One (1) 2 circuit (white/blue) index light assembly +/- 25'-0" long
8. One (1) Outrigger batten assembly w/ mounting brackets on maximum 10'-0" centers and two (2) wall sleeves +/- 29'-0" long (downstage wall to upstage wall).
9. One (1) lot of custom system signage.
10. Four (4) auditorium side lighting booms as shown in the drawings. Coordinate installation with electrical contractor and stage lighting contractor
11. Provide the following miscellaneous items:

1 lot Stage draperies and storage bags per drawings, schedules and specifications
1 lot Drapery tracks per drawings, schedules and specifications
15 ea 3/4" ID sched 40 pipe 10'-0" long, threaded each end (cyclorama, white scrim, and black scrim bottom pipes)

- 5 ea 3/4" ID sched 40 pipe 5'-0" long, threaded each end (cyclorama, white scrim, and black scrim bottom pipes)
- 21 ea 3/4" ID sched 40 pipe treaded pipe couplings (cyclorama, white scrim, and black scrim bottom pipes)
- 1 Lot Fall protection systems at the loading gallery, side auditorium torm light ladders, and any stage and auditorium access ladders over 10'-0" in height, as described herein.

C. Bills of Materials – Alternate #5

1. Provide one (1) complete system of twelve (12) each 8'-0" wide double sided acoustical banners, hoists, and programmable control, as specified herein and as shown on the drawings. The system shall be made up of (but not limited to) the following components:
 - 12 ea 150 lb capacity electrically powered, two (2) drum banner hoist.
 - 1 ea Programmable control capable of targeting and presets for both individual hoists, and hoists in groups, Hold-to-run pushbutton control, with Power On/Off key switch
 - 1 ea Wired or wireless control pendant/remote control

3.03 RIGGING EQUIPMENT SPECIFICATIONS

A. Fire Safety Curtain System

1. General:
 - a. Furnish and install a motorized straight lift type, automatically closing fire safety curtain for the proscenium opening indicated on the drawings. Curtain shall lap masonry not less than 18" at each side of the proscenium opening and 24" at the top of the proscenium opening.
 - b. The curtain shall be arranged to comply with the "International Building Code (2006)," American National Standard E1.22-2009, other applicable codes and, in general, intercept fire and smoke and prevent glow from severe fire on the stage from showing on the auditorium side for at least thirty (30) minutes in order to permit safe egress of all people from the auditorium.
 - c. In "emergency mode", the curtain shall close by gravity, with the speed of descent controlled by a hydraulic speed regulator. Emergency closing must occur in less than thirty seconds when the fire line is released or fusible links separate, with the last 8'-0" of travel taking no less than 5 seconds.
 - d. The system shall be capable of operating in a "non-emergency mode", allowing the users to raise and lower the curtain via push button controls as needed, independent of any emergency release or deployment system.
2. Special Conditions: It is the intention of this specification to provide a fully functioning fire safety curtain system. Actual equipment and components must reflect building conditions and approved construction drawings. All dimensions must be field verified by the Rigging Contractor.

3. Fire Safety Curtain: The curtain shall be fabricated from tightly woven non-wire inserted, non-asbestos, non-carcinogenic silica based cloth, 12 x 7 weave of .070" thickness weighing at least 40 ounces per square yard. The curtain shall bear a certification label from a nationally recognized listing agency. All strips of fabric shall be in continuous lengths running the full height of the curtain. There shall be no horizontal seams. Each seam shall be sewn with two lines of stitching using fiberglass thread. Top and bottom pockets shall be 6". The bottom pocket shall be equipped with a 3" yield pad filled with similar material.
4. Smoke Seal: Provide a smoke seal consisting of a triple layer of folded fabric fastened above the proscenium with a mounting clamp so it rubs the curtain and seals the top of the opening. The fabric shall be tightly woven non-wire inserted, non-asbestos, non-carcinogenic silica based cloth with a minimum weight of 27 oz. per square yard.
5. Line Shaft Fire Curtain Hoist:
 - a. The hoist shall consist of a gearmotor assembly, a drum for each lift line, and interconnecting shafts. The gearmotor assembly shall include a brake release and a hydraulic speed regulator, allowing the curtain to close at a controlled rate of speed when the brake is released by the activation of the fire line. The hoist shall have a minimum 1,400 pound lifting capacity at a rate of 25 feet per minute. It shall be an integrated unit, with the first stage pinion gear and the primary brake both mounted directly on the motor's armature shaft. No couplings will be permitted between the motor, primary brake and gear reducer.
 - b. Motors shall be totally enclosed fan cooled (TEFC). The motor shall have a minimum AGMA service factor of 1.0 for constant operation.
 - a. The gear reducer shall be a helical bevel reducer. The gear case shall be cast iron for protection against shock damage. The output shaft(s) shall have double lip oil seals to prevent leaks. The gearing service factor shall be a minimum of 1.0 with a mechanical strength service factor of 1.25.
 - b. Brakes shall be normally spring applied, direct acting, electrically released, and equipped with a manual release. The brake shall be an AC / DC electro-magnetic unit with a minimum retarding torque equal to 200% of motor full load torque.
6. Drums
 - a. Each helical drum shall be supported by a sturdy steel base, holding the elements of the drum assembly in proper alignment. Both ends of each drum shall be supported by a self-aligning flange bearing.
 - b. Alternate drums shall be threaded in opposite directions, to keep the batten from "walking" as its elevation changes.
 - c. Drums shall be interconnected by shafts with universal joints or flexible chain couplings at each end. Universal joints shall be used for assemblies not utilizing a common structural "backbone" designed to maintain shaft alignments within manufacturer's tolerances.
7. Rotary Limit Switches:
 - a. Rotary limit switch assemblies shall have two or four independently adjustable switch/cam sets as required. Cams shall be driven by a geared assembly.
 - b. Switches shall have snap acting contacts.

- c. Rotary limit switches shall be driven directly or by roller chains. If roller chains are used, sprockets shall be pinned to prevent slipping and sized for maximum usable rotation of switch cams. The input shaft and drive chain shall be fully guarded.
 - d. Switches shall be mounted to the hoist base to allow for easy adjustment of the switch settings.
8. Fixed Speed Starter:
 - a. The traction drive hoist shall be controlled by a UL 580E listed, full voltage, self-protected, reversing starter. Enclosure shall be NEMA 12 with hinged, latching cover. The interior of the starter cabinet shall be "touch safe" per IEC 204-1 "Protection against direct contact" rules.
 - b. The NEMA/IEC, magnetically operated, mechanically and electrically interlocked, reversing starter shall be sized to match the hoist motor horsepower and shall be rated for plugging and jogging. Units shall incorporate UL580E Type 2, non-welding, positive break contactors.
 - c. Overcurrent protection shall be provided by an IEC Class 10 overload. Short circuit protection shall be provided by a circuit breaker.
 - d. Starters shall be wired so that operation of the normal end of travel limit switches shall only allow movement away from the limit switch. Operation of an overtravel limit switch shall open the line contactor, and will not allow further movement in either direction. A spring return toggle switch shall be housed inside the starter cabinet to allow override of the overtravel limits for resetting purposes.
9. Control Station: One control station shall be provided in wall mounted NEMA 12 enclosures. Control Station shall contain hold to operate (dead man) Up and Down pushbuttons, a mushroom head emergency stop pushbutton, and a keyed power On/Off switch. Device shall be mounted approximately 5' above the stage floor on the stage left of the proscenium, immediately adjacent to the manual release system, clear of any curtains or other obstructs to line of sight.
10. Battens: Battens shall be made of 2" I.D., schedule 40 black iron pipe. Fabrication shall be as for standard sets.
11. Fire line System: The manual fire line release system shall consist of a 1/8" diameter wire rope, with UL Listed 160°F fusible links spaced a maximum of 15'-0" apart, side mounting pulleys as required, and two manual lever-arm type fire line release devices, each mounted in enclosures. Devices shall be mounted 5' above the stage floor on each side of the proscenium immediately adjacent to the fire line, clear of any curtains or other obstructs to line of sight. All other components such as round weight arbors, arbor guards, floor pulleys, etc. required to form a fully functional fire line release system shall be provided.
12. Lift Cables: The curtain lift cables shall be 1/4" diameter 7 x 19 galvanized utility cable as specified. Cables shall be terminated with corresponding cable thimbles and two forged cable clips or a Nicopress[®] fitting at each end. The curtain end of each cable shall be attached to the batten using a 3/8" x 6" turnbuckle and pipe clamp.

13. Safety Chains: Supply one more safety chain than the number of lift cables. 1/4" minimum, alloy chains shall be located between lift cables except at the ends where chains shall be 12" or less from the end of the batten. Chains shall be attached to the top of the curtain with pipe clamps around the top of the batten and chain shackles. The other end shall be appropriately attached to the gridiron structure.
14. Smoke Pockets with Track: Furnish and install one pair of smoke pockets to extend from the stage floor to the height specified in the drawings. Pockets shall consist of a 6" deep "Z" channel formed from 1/4" steel plate and a 1/4" x 18" steel plate which shall be bolted to the channels on 2'-0" centers. A 14 ga. steel channel track, entirely enclosed except for a slot in the side, shall be bolted to the side of the smoke pocket to carry the guide rollers. Channels shall be anchored to the walls on 4' 0" centers.
15. The sides of curtain shall have steel roller guides every 18", securely fastened to a 5" galvanized steel hem with at least three bolts or rivets. Each guide shall have four steel wheels, which properly engage the track in the smoke pocket.
16. Electrical Fire Line Release System:
 - a. The fire curtain shall be equipped with an electro mechanical release system which is activated rate of rise heat detectors. A switch shall be mounted in the release mechanism enclosure for testing system operation. Activation of release mechanism shall release tension in the fire line, which, in turn, allows the fire curtain to close. The release unit shall incorporate systems to prevent accidental release.
 - b. The release shall contain an integral battery and charger to provide emergency power during power interruptions. The release shall operate from a 120 VAC power source.

B. Counterweight Assist Hoist – General

1. The hoist shall be of a compact design with all required components integrated into its structure. It shall be floor mounted in a manner to properly accommodate a 1,000 lb upward load.
2. The hoist assembly shall be less than 12" wide, and be able to automate a set that is located between existing sets on 6" or greater centers.
3. When installed on a counterweight set of adequate capacity, the PowerAssist motorized counterweight set shall accommodate up to a 0 – 2,000 lb variable load at a speed of 25 fpm, without re-weighting. The hoist will handle an out of balance load equal to 50% of the set capacity. The counterweight arbor will be permanently loaded to 50% of the set capacity, allowing the use of a smaller motor. The counterweight in the arbor shall be banded in place, and a method to impede the installation of additional counterweight provided. A sign shall be provided warning the user not to adjust the weight in the arbor.
4. All components shall be designed to properly support the required loads.

C. Counterweight Assist Hoist Motor, Gearbox and Brake:

1. A motor, gear reducer and primary brake shall be provided. Motors shall be totally enclosed fan cooled (TEFC) per NEMA MG1.

2. The gearmotor shall have a minimum service factor of 1.0 and be provided with seals to effectively prevent leaks.
3. Brakes shall be spring applied, direct acting, electrically released, and equipped with a manual release. The brake shall be an electro-magnetic unit with a minimum retarding torque of 200% of motor full load torque. The brake shall be released by energizing the coil simultaneously with the motor winding to provide fail-safe braking in case of power failure.

D. Counterweight Assist Hoist Drive Medium

1. The drive medium shall allow the use of the existing head block without modification and shall be positively driven in a manner that will allow repeatable positioning.
2. The drive medium shall have a minimum design factor of 10:1
3. Roller chains shall have a double leaf construction. UHMW chain guides shall be provided to ensure positive engagement of chain and sprockets, even with slack in the drive chain.
4. The portion of the drive medium that runs on the head block shall operate at the same pitch diameter as the lift lines so that they operate at the same speed, to avoid excessive cable wear and “jumping” caused by differing speeds.

E. Counterweight Assist Hoist Limit Switches

1. All hoists shall have positively actuated limit switches for normal end of travel. Actuation of the normal end of travel limit switches shall only allow movement away from the limit switch.
2. Positively actuated limit switches shall be provided for over travel, redundant to the normal limits. These shall use a separate circuit to positively disconnect power from the hoist, using a UL580E Type 2, non-welding, positive break contactor. An override mechanism to allow resetting of the over travel limits shall provided.

F. Counterweight Assist Hoist Motor Controllers:

1. General: The control system shall be specifically designed for the control of theatrical rigging, including operational and reliability needs. The system shall provide easily understandable and reliable position control of counterweight assist hoists. The controller shall be provided to fit a 9U space in the Backstage Control Panel (BSCP) rack as provided by the stage lighting contractor. Coordinate requirements with the stage lighting contractor.
2. Operation:
 - a. A 6" color, industrial touch screen display will provide clear, easy to understand graphics for simplicity of operation. Movements will be set up using the touch screen. UP, DOWN, GO TARGET pushbuttons and a joystick are provided for initiation and control of movements.

- b. Operation styles available shall range from direct position control using UP and DOWN buttons to composing presets with a minimum of four (4) target positions (excluding end of travel and overtravel limits). Presets can be composed, stored, modified, and recalled to allow simple recording and re-creation of movements.
 - c. The graphic user interface shall provide a hoist controller; preset creation and editing facilities; and a display of the current position and target position of each hoist. A complete display of hoist status and faults shall be provided for ease of troubleshooting and maintenance.
 - d. Actual pushbuttons shall be provided for initiation and control of motion. For safety, no movement will be initiated from the touch screen. "Deadman" operation is required, so that the operator must be at the console and pressing a button for motion to continue.
 - e. The system shall include password-protected access, with separate levels for user, supervisor, and setup functions.
 - f. A mushroom head "EMERGENCY STOP" button wired to a failsafe circuit that conforms to NPFA 79 requirements shall be provided.
 - g. An "ON/OFF" key operated switch shall be provided that removes power to the console, motor starters and drives. Any control system that requires motors and drives energized while the system is not in use is not acceptable.
3. Reliability:
- a. The control system shall use an off the shelf industrial grade Programmable Logic Controller (PLC) selected for long term, reliable operation under the conditions and environment at the site. "Home" or "office" computers are not allowed, as they do not provide the level of reliability necessary for overhead lifting.
 - b. All hardware components shall be industrial grade equipment designed for use in a typical theatre environment. These components shall be widely available on an international basis to ensure ease of replacement and maintenance.
 - c. The system program shall be embedded in ROM (Read Only Memory) to prevent corruption or unauthorized changes.
 - d. Actual pushbuttons shall be provided for initiation and control of motion. Systems that allow motion to be initiated from a touch screen are known to allow unintended movement and are not safe.
 - e. A "Service" indicator shall be provided to indicate when routine service and inspection of the rigging system is required.
 - f. Control systems shall be UL or ETL marked as meeting UL 508A Standard for industrial control panels.

G. Upright Head Block:

1. The sheave shall be Nylatron® or Polyamide (PA6-G) nylon or ASTM A48 Class 30 grey iron casting with a 12" outer diameter. The rope and cable grooves shall have equal pitch diameters. The sheave shall be equipped with a 1" diameter machined steel shaft and two tapered roller bearings.
2. Base angles shall be a minimum 2" x 1-1/2" x 1/4" angle with the short leg turned in.
3. Side plates shall be a minimum of 10-gauge steel, and shall fully enclose the sheave. Side plates shall be bolted and welded to the base angles for extra strength. There shall be a minimum of six bolts with spacers between the side plates, four of which prevent cables from escaping the sheave grooves.

4. The block and associated mounting hardware shall have a recommended working load of at least 2,500 lbs.
5. Head blocks shall be grooved for 6 each ¼" lift lines and one ¾" hand line.

H. Underhung Loft Blocks:

1. The sheave shall have an 8-½" outside diameter, and shall be Nylatron® or Polyamide (PA6-G) nylon. The sheave shall be equipped with a 17 mm diameter machined steel shaft and two sealed, precision ball bearings.
2. Base angles shall be a minimum 1-½" x 1-½" x 3/16" angle punched with mounting hardware holes as required.
3. Side plates shall be a minimum of 12-gauge steel, and shall fully enclose the sheave. Side plates shall be bolted to the base angles. There shall be a minimum of seven ¼" bolts with spacers between the side plates, four of which prevent cables from escaping the sheave grooves.
4. The block and associated mounting hardware shall have a recommended working load of at least 750 lbs, and shall be designed for use in either upright or underhung usage.

I. Sag Bar Assemblies:

1. Sag Bars shall be provided to keep the lifting cables from sagging over their horizontal span and coming in contact with the upright mounted loft blocks. They shall not be installed to carry line loads or to act as deflector or mule blocks.
2. Provide nine (9) segmented sag bar assemblies at the three centermost loft block locations, running downstage to upstage, and installed on top of the loft block housings. Provide as shown on the drawings.
3. Sag bars shall consist of a minimum 1-1/2" x 1-1/2" hardwood or UHMW rub or wear bar supported by a continuous Unistrut steel structural shape. Secure attachment to the loft blocks shall be at 5'-0" minimum spacing
4. Attachments at the loft blocks shall be by mechanical means (bolts or clips). Welded attachments are not permitted.
5. All nuts for all bolted connections shall be of the nylon insert self-locking type.

J. 10" Tension Floor Block:

1. The cast iron sheave shall have a 10" outside diameter, and shall be an ASTM A48 Class 30 grey iron casting, with a machined groove for a ¾" rope.
2. The sheave shall be equipped with a 17 mm diameter machined steel shaft and two sealed, precision ball bearings.
3. Side plates shall be a minimum of 3/16" steel plate.
4. The block shall have a minimum weight of 40 lbs. to properly tension the hand line.
5. A kick tab shall be provided to permit adjustment of the rope tension.
6. The floor block shall be held in place and guided in the T-bar guides by two guide shoe assemblies, each consisting of two guides and one spacer made of 5/16" thick steel plates. Each guide shall be secured to the housing by means of two 3/8" hex head bolts and nuts.

K. J-Guide / T-Bar Arbors:

1. Arbors shall be 6'-0" long.
2. The arbor top shall be a 1/4" steel plate formed into a channel with 3" sides, punched to receive 8 cables. A bolt and spacer shall tie the legs together and provide a tie-off point for the hand line. The front top and bottom of the arbor top shall carry a 1- 1/2" high white set number.
3. The arbor bottom shall be of similar construction, with counterweight rests to keep the weights from resting on the inner arbor rod nuts.
4. The top and bottom of the arbor shall be tied together by means of two 3/4" steel arbor rods and a 3/8" x 3" steel back plate. The arbor rods shall have three nuts at each end, the outermost being a lock nut.
5. Two guide assemblies shall be provided, each comprised of UHMW plates between steel backup plates or molded plastic shoe assemblies with stiffening ribs, secured to the arbor by means of two 3/8" hex head bolts and lock nuts.
6. Provide 12-gauge spreader plates (two minimum) on arbor rods so they can be spaced between counterweights on 2 foot centers. Provide a retaining collar on each rod, each with a 1/4" set screw with red plastic knob for easy locking. The front retaining collar shall be welded to the top spreader plate.
7. Provide labels on the steel back plates showing the proper locations for the spreader plates.

L. Counterweight:

1. Counterweights shall be 6" wide x 13-3/4" long, with a U shaped cutout for the arbor rods. Counterweights shall be flame or laser cut steel. Each piece shall be free from slag and sharp edges. The thickness of counterweights shall not vary more than 3/16" from nominal dimension.
2. Opposite corners shall be notched for ease of handling. Alternate weights when stacking to provide finger holds when loading arbors.
3. Provide 80% of weight 2" thick and 20% of weight 1" thick for ease of balancing.
4. Provide 650 lb of counterweight per lineset, unless otherwise specified elsewhere. Balance all installed equipment and store remaining counterweight at the upper level loading bridge.

M. Rope Lock:

1. The rope lock shall consist of an ASTM A536 ductile iron housing, cams and handle. The housing shall allow the use of a standard padlock to hold the handle in its closed position.
2. Provide one (1) padlock PER ROPE LOCK, all keyed alike.
3. In order to reduce noise during operation, there shall be a rubber bumper in the housing to silence the handle when it is opened. The dogs that grip the rope shall be machined to fit closely to reduce noise, and shall not require the use of washers.
4. Adjustment for rope shall be from 5/8" to 1" by means of a 1/2" nylon tipped, socket head adjustment screw with lock nut at the rear of the housing.

5. The handle shall be 9" long with a nylon powder or vinyl dip coating. The handle shall be installed so that it passes two degrees past vertical to lock the hand line.
6. A coated, oval, welded steel ring shall be provided as a safety lock.
7. The rope lock shall mount to the locking rail with four 3/8" hex bolts and lock nuts.

N. Locking Rail:

1. The locking rail shall be punched to receive rope locks on 8 inch centers.
2. Rope locks and index cards shall be mounted on a formed steel angle no smaller than 3-1/2" x 5" x 1/4".
3. The onstage edge of the rail shall be sloped and punched to receive formed clips which hold index cards centered on the installed sets. Provide one numbered plastic write-on card for each installed set.
4. Stanchions made from 1/2" x 3" flat bar shall be provided on 5' (maximum) centers.
5. The entire locking rail shall be designed and installed to withstand a minimum up load of 500 pounds per foot.

O. Outrigger Brackets:

1. Angle iron outrigger brackets shall be made of 3/16" x 1- 3/4" x 1-3/4" angle and spaced not more than 10 feet apart. The brackets shall be attached to the wall battens of the arbor guide system so that the batten is located 10 feet above the gallery or stage floor. The brackets shall include clamps for attaching the batten.
2. The outrigger batten shall be made from 1-1/2" I.D., schedule 40 pipe extending from the downstage to upstage wall.. Specifications are the same as other battens.

P. Index Light:

1. Each index light unit shall consist of a sheet steel housing containing lamp sockets mounted 12" apart and wired alternately on two circuits with leads and junction box at either end. Sockets shall be suitable for 40 Watt, A type lamps.
2. Units shall be constructed so as to light the locking rail and prevent light from spilling on stage. The exterior of the index strip light shall be painted a matte black, the interior shall be white. Units shall be supplied in five and ten foot sections.
3. Index strip lights shall be UL Listed.
4. Provide dimmable 60 Watt equivalent LED, A type lamps in white and blue, plus 5 spares or each color.

Q. Arbor Guide System:

1. The complete arbor guide system shall consist of full battery of 39 vertical T's or J's, each 46'-6" long, located to receive sets on 8" centers. Vertical T's or J's shall be 1-3/4" x 1-1/2" x 3/16" extruded aluminum members.

2. Guides shall be held in place by extruded aluminum clips, which are bolted to the wall battens. The clips and guides shall be formed so that they lock together in accurate alignment. There shall be no need for holes or slots in the guides.
3. Horizontal wall battens shall be located on centers not to exceed 5'. Wall battens shall be 1-3/4" x 1-3/4" x 3/16" steel angles with factory punched holes guides to be located on 8" centers.
4. Wall battens shall be held in place by adjustable wall knees, consisting of a 5/16" x 1-1/2" steel knee and an 11 gauge 1" x 2" formed, slotted channel to aid in alignment made necessary by irregularities in the wall.
5. There shall be a top stop batten, a bottom stop batten and a floor batten, all of which shall be made of 1-3/4" x 1-3/4" x 3/16" steel angle. The top and bottom stop battens shall each have a 2" x 2" hardwood bumper securely bolted to the stop battens by 1/4" x 2-1/2" carriage bolts, nuts, and washers.
6. Stop battens shall also be provided with a minimum 1/2" thick neoprene "bumper" strip mechanically fastened to the wooden stop battens. Glued applications are not acceptable.
7. All other members of the guide system shall be assembled using 5/16" hex head bolts, lock nuts and washers.
8. Systems utilizing 1 1/2" x 1 1/2" x 3/16" steel T-bar and U-shape style spaces shall also be acceptable.

R. Black Hand Line

1. Hand line shall employ black 3-strand composite construction combining filament and staple/spun polyester wrapped around fibrillated polyolefin. Handline shall be New England Ropes "Multiline II" or approved equal.
2. Hand line shall be black in color.
3. The hand line shall contain an identifying tape showing the manufacture's name, phone number, website, and year of manufacture.
4. The hand line shall contain a red safety/wear indicator that will become visible as the rope nears the end of its useful life.
5. The rope shall hold knots well, be easily spliced and be dense enough to allow it to be clamped in a rope lock without damage. Rope shall not be subject to rotting, mildew, or moisture damage nor shall its length be affected by changes in humidity.
6. Tape ends before cutting. Attach to arbor with two half hitches or bowline and tape end to standing line with two (2) each black plastic cable tie wraps. The use of tape of any kind is not permitted.

S. Trim Chains:

1. Trim chains shall be 36" long, made of 7mm (1/4") self-colored alloy chain with a working load limit of 3,250 lb. Chain shall comply with OSHA 1910.184(e)(5) requirements for sling use. Chain shall bear the mark of the manufacturer and a date code for traceability.
2. Connection between the end link and the lifting cable shall be made with a thimble and copper oval compression (Nicopress) sleeve.

3. Chains shall be wrapped one and one half turns around the batten and attached back to the thimble at the end of the lift line with a standard ¼" forged shackle. Adjustment is made by connecting the shackle into a link along the return side of the chain.
4. Trim chain assemblies shall be made up of SECOA "STC Chain", JR Clancy "Alpha Chain", or approved equal

T. Lift Cables:

1. All lift cables shall be ¼" diameter, 7 x 19 construction, galvanized, small diameter utility cable, with a breaking strength of 7,000 lb.
2. Damaged or deformed cable shall not be used. All wire rope rigging shall be installed so as to prevent abrasion of the wire rope against any part of the building construction or other equipment.

U. Cable Fittings:

1. Swaged sleeve fittings shall be copper Nicopress™. Swaged fittings shall be installed per the fitting manufacturer's instructions, using the appropriate tools, and checked with the appropriate Nicopress™ "Go - No go" gauge. Clamp type "cable clips" shall not be permitted.
2. Eyes shall be formed over galvanized wire rope thimbles of correct size.
3. Exposed cable ends shall be wrapped in high quality, "self-fusing" black electrical tape.

V. Turnbuckles: Turnbuckles shall be drop forged and galvanized, and conform to ASTM F-1145 Type 1, Grade 1. Turnbuckles shall be moused after adjustment to prevent loosening.

W. Pipe Battens:

1. All battens shall be 1-1/2" nominal inner diameter, Schedule 40 black iron pipe in lengths as shown on the drawings.
2. All joints shall be spliced with 18" long sleeves with 9" extending into each pipe and held by two 3/8" dia. x 2 1/4" long hex bolts and low profile jam lock nuts on each side of the joint. Welded connections are not permitted. Any gap between pipe sections shall not exceed ¼".
3. Each end shall be covered with a bright yellow, closed end, soft vinyl safety cap at least 4 inches in length.
4. Pipe battens shall carry set numbers, lift line, and centerline indicator marks as specified in Section 3.04.A

X. Vertical Side Auditorium Tormentor Lighting Pipes

1. The four (4) each side auditorium lighting pipes shall be constructed from lengths of 1-1/2" nominal I.D. schedule 40 iron pipe.
2. Assembly shall consist of a two vertical pipes +/- 14'-0" long, with horizontal pipes located on 2'-0" centers, bracketed out from the side wall.

3. Attachments to wall shall be such as to allow the user to support a ladder against the assembly to access the lighting equipment without movement. Assemblies shall be located as shown on the drawings. Coordinate mounting requirements and any in-wall blocking with the general contractor.
- Y. Fall Arrest System and Harnesses:
1. Loading Gallery:
 - a. Provide a horizontal lifeline type fall arrest system at the loading gallery meeting the requirements of ANSI Z359.1-2007. Install so as not to impede the loading and unloading of the counterweight arbors.
 - b. System shall allow two persons to work at the same time in the same general area.
 - c. System shall include anchorages at each end of the loading gallery. Coordinate requirements with general contractor. Provide any required additional structure necessary to support the systems from the building structure.
 2. Auditorium Torm Light Ladders:
 - a. Provide four (4) vertical lifeline type fall arrest system at the rear/behind the auditorium torm light ladder positions meeting the requirements of ANSI Z359.1-2007. Install so as not to impede the safe access to lighting equipment installed on the light ladders. Provide tag lines as may be required to access retractable lifelines.
 - b. Systems shall include anchorages to the building structure. Coordinate requirements with general contractor. Provide any required additional structure necessary to support the systems from the building structure.
 3. Gallery or Catwalk Access Ladders:
 - a. Provide vertical lifeline type fall arrest system at all gallery or catwalk access ladders taller than 10'-0" meeting the requirements of ANSI Z359.1-2007. Install so as not to impede the safe access to lighting equipment installed on the light ladders. Provide tag lines as may be required to access retractable lifelines.
 - b. Systems shall include anchorages to the building structure. Coordinate requirements with general contractor. Provide any required additional structure necessary to support the systems from the building structure.
 4. Retractable systems shall employ dual inertia braking systems, and the equipment shall be able to be recertified in the event of a fall.
 5. Provide six (6) each heavy duty full body fall arrest harnesses, complete with a sliding dorsal D-ring, positioning D-rings at the hips and chest, adjustable shoulder, chest, waist, and left straps, removable/washable one piece back and shoulder pad, hip/lower back pad, and sub-pelvic strap. Verify sizes to be provided with Owner.
- Z. Adjustable Acoustic Banner System (Alternate #5)
1. General:
 - a. Provide a complete system of 12 each adjustable acoustic banner hoists, arranged in two groups, as shown in the drawings.
 - b. Provide a programmable control system capable of multiple presets, as specified herein.

2. System characteristics:
 - a. System shall consist of individual self-contained hoist modules with integrated acoustical banner for each location shown on the drawings. Each self-contained unit shall be comprised of all electronics, plugs, motors, sensing devices and lift lines and shall be sized according to its purpose.
 - b. Each hoist shall be capable of bi-directionally communicating to a central controller.
 - c. The central controller shall be capable of independently controlling the full acoustical hoisting system.
 - d. All high and low voltage wiring shall be distributed via two independent system wireways as described herein, except as noted in the specification.
 - e. Speed: 0-20 feet per minute
 - f. Minimum Gross lifting capacity: 150 lb
 - g. Maximum travel: See drawings.
 - h. Minimum number of lifting lines: 2
 - i. Electrical: Single phase, 120VAC, 240VAC, or 480VAC, as available (see project's electrical drawings)
 - j. Braking: Primary and secondary brakes shall be of the electromechanical type and shall be rated at a minimum of 150% of full load.
 - k. Mounting: Unit shall be capable of wall mounting, or as an under hung connection to the building structure. Any additional mounting steel or framing (i.e. Unistrut) required for installation shall be provided by the stage rigging contractor.
 - l. Fabric: 24 oz Wool Serge in a color to be selected by the architect from manufacturer's standard color selections. Banners shall be double sided.
3. Acoustic Hoisting Equipment
 - a. Furnish single, fixed speed, hoists attached horizontally to structural steel provided by others and complete with integrated acoustic banner as specified herein. Each compact hoist shall incorporate its own control enclosure containing one AC flux vector motor drive and all control components necessary to meet this specification without the need for secondary motor rooms. Each hoist with its banner shall be tested by the manufacturer prior to shipment.
 - b. Hoists systems that require motorized fans to cool the motor or the AC flux vector drive shall not be acceptable.
 - c. Each hoist module shall incorporate an electro-mechanical secondary emergency/holding brake which operates in tandem with the primary motor brake. Dual, independent braking systems shall be standard on every hoist module. Braking shall occur instantaneously in the event of motor brake failure, drive system failure, system fault, or power failure. Braking shall occur with virtually no impact to the load or to the structure to which the hoisting system is attached. Any type of over-speed brake which engages randomly and requires recalibration after a single duty shall not be allowed.

- d. Each hoist controller must have the ability, and be preset, to restrict the current output to the motor in the amount of not more than 115% of the motors full load current at the designed load.
- e. Except as noted, each hoist module shall have safety latching or twist-locking connectors for power, control and network connections. All connectors and plugs must be of the male type and be factory installed and tested.
- f. The input voltage requirement for all compact hoists shall be either 200-240 VAC +/- 10%, 50/60 Hz Three Phase or 380-480 VAC +/- 10%, 50/60 Hz Three Phase, unless otherwise specified.
- g. Each hoist must pass a dielectric voltage withstand test in accordance with UL 1340 standards to ensure that there is not excessive leakage current to ground anywhere in the electrical system.
- h. Each banner hoist module shall have three levels of limit switch protection in both the up and down direction. The hoists controller shall be responsible for interpreting and responding to all limit switch feedback to ensure immediate response as well as respect all software limits as programmed. These three levels of protection shall consist of: "Ultimate" and "Normal" hard struck limits, and "Factory" programmed software limits.
- i. The upper "Ultimate" and "Normal" limits must have the ability to be easily adjusted in the field and must maintain their position relative to one another during adjustment to ensure that the factory set relationship is not jeopardized. This shall be a requirement for the down "Ultimate" and "Normal" limit switch adjustment as well. The maximum travel between activation of the "Normal" limit and activation of the "Ultimate" limit in either direction shall not exceed 6" (150mm).
- j. The hoists controller shall have the ability to perform a "Homing Routine" intended to teach the unit its maximum allowable travel distance. This "Homing Routine" must first activate the lower "Normal" limit switch and then the upper "Normal" limit switch. Once complete, the hoist will be allowed to function in the Administrative and the User modes. This ensures that the full travel of each unit is free from obstruction and that all limit switches are properly set. This routine must only be executed by a factory certified contractor or factory service technician during installation and system set-up. "Normal" or "Ultimate" limits shall not be repeatedly activated during normal operation. They shall serve as redundancy only.
- k. All components included within the hoists' design shall be treated or otherwise designed to avoid oxidation. Untreated or bare steel surfaces, which encourage oxidation, shall not be acceptable or incorporated in any portion of the system.
- l. Each banner hoist module shall have a single, helically grooved wire rope drum that envelopes a minimum of 70% of the wire rope diameter.
- m. Each hoist shall have integrated standard mounting brackets for attachment to wall mounted stands or directly to the building structure. Where required, non-standard mounting brackets or auxiliary support shall be furnished by the stage rigging contractor as required and approved for attachment to building structure.
- n. Each compact hoist module shall be fully enclosed in a cover. This cover shall completely enclose all moveable parts. This cover shall act as a barrier to un-wanted contaminants or objects which could otherwise become fowled in the mechanism and

shall serve to dampen the sound of the hoist during operation. The cover shall be finished as indicated on the project's finish schedule.

- o. All lift cables shall be 3/32"Ø, 7 x 7 construction, galvanized aircraft cable (GAC), with a minimum breaking strength of 920 lb. (417 kg). In no case shall used, damaged or deformed cable be used. All wire rope rigging shall be installed to prevent abrasion of the wire rope against any part of the building construction or other equipment.
- p. Cable fittings and sheave diameters shall conform to wire rope manufacturer's recommendations as to size, number and method of installation. Cable clips are not allowed. All cable terminations shall be formed using load-rated copper swaged fittings. Swaged fittings shall each be installed per the manufacturer's instructions using the appropriate tools and checked with the manufacturer's certified "Go - No Go" gauge. Eyes shall only be formed over galvanized wire rope thimbles of the correct size.
- q. Cable terminations must include proper means of adjustment so that the curtain can be easily leveled during installation.
- r. Acoustical banner material shall meet or exceed the sound absorption values listed below based on testing in accordance with ASTM C-423 (minimum 12-inch airspace between the wall and the outer banner face).

Octave Band Center (Hz)	63	125	250	500	1000	2000	4000
Sound Absorption Coefficient	0.20	0.65	0.95	0.90	0.90	0.90	0.90

- s. Acoustical banners shall be constructed of a double layer of 24-ounce per square yard wool serge as shown on the drawings.
- t. Acoustical banners shall be fabricated in panels, including spacers and a bottom lifting channel and top attachment channel capped and finished as indicated on the project's finish schedule. When deployed, the banner panels shall maintain a separation of 3-inches, 6-inches, 9-inches or 12-inches as detailed on the drawings through the full travel distance of the banner. Lift lines shall terminate to the lifting channel with field adjustable trimming hardware as specified herein. When fully retracted the banners shall store in an organized and visually acceptable manner. In general a 15'-0" high banner shall require not more than a 1'-0" high storage space.

4. Acoustic Banners System Controller

- a. The Master Controller shall be a wall mounted control station designed for use with selected acoustic banner hoists. It shall be housed in a rugged steel enclosure to protect system components. The control surface shall be located at a convenient operator elevation and the Master Controller shall be located in a wing of the performance room's platform/stage with direct visual access to the stage and audience chamber in order to properly view the acoustic banner hoists' movements.
- b. The Master Controller shall support a limited function Wired Remote Control station that can be plugged into the master station or at multiple remote locations to allow a technician to move hoists, set or modify presets, etc. from a variety of onstage positions where she/he can best view the banner hoists' movements.

- c. Controllers shall each feature a full-color LCD touchscreen Human Machine Interface (HMI) to allow for easy navigation and set up of movements as well as emergency stop pushbutton and key operated system “on/off” switch. Momentary contact (dead-man style) push buttons (Up, Down, Go to Target) shall be depressed for any hoist movement to occur.
- d. In addition to the emergency stop push buttons that are integrated into the master controller and the wired remote control, stand-alone emergency stop pushbutton stations shall be available.
- e. In addition to control receptacles for the wired remote control located at the master controller, stand-alone Remote Control plug-in stations shall be available.
- f. There shall be four (4) levels of User Account access to the control system (Inactive, Normal, Administrative, Factory). The Administrator shall be authorized to set up and change all User accounts, except Factory accounts.
- g. The control system shall be capable of operating up to four (4) hoists in any single “pre-set” movement. The rigging control system shall support up to thirty-two (32) hoists in its basic configuration.
- h. “Manual move” operation shall allow the user to move one hoist at a time in “jog mode” without pre-setting a target elevation or speed. This function allows for easier set-ups of shows as well as for determining what the proper “play” elevation(s) are for different acoustic banner needs.
- i. Controllers shall allow for direct position control to create, save and modify a maximum of four (4) soft “function presets” including parameters such as hoist speed, acceleration, deceleration and targets for each acoustic banner hoist. By selecting multiple function presets hoists can be run together, in multiple hoist “motion preset” mode.
- j. In general, preliminary use designations shall be:
 - i. TARGET 1: All banners retracted (chamber music, choral music, organ)
 - ii. TARGET 2: 33% of banner area exposed (wind ensembles, string ensembles)
 - iii. TARGET 3: 66% of banner area exposed (jazz, piano recital, musical theatre)
 - iv. TARGET 4: 100% of banner area exposed (amplified music, speech, assembly)
- k. Controllers shall display hoists selected for each manual move or motion preset, as well as their changes of elevation, target elevation, etc. through each move. Error reporting shall include over/under travel as well as load sensing, emergency stop activation, trip log, etc.
- l. Furnish to the owner an engraved, wall-mountable “operator instruction sheet” with a summary of steps to set, record and replay presets.
- m. Furnish to the owner an editable and printable “acoustical banner position schedule” form in order to allow users to document and save commonly used banner deployments specific to their performance needs and customs.

5. Acoustic Banners Control Network

- a. The Command and Status of drives connected to the rigging system shall be through a MODBUS, or approved equal, open-source industrial motion control network. Communications cable shall be as shown on approved shop drawings. The network shall be capable of running up to four (4) hoists in any one motion preset (bi-directionally). The entire network shall support up to thirty-two (32) hoists in its basic configuration.
- b. All controllers shall be pre-configured and tested prior to shipment in order to expedite the final commissioning process.
- c. Emergency stop functions shall be hardwired in series with all the emergency stop buttons and shall be independent of the MODBUS communications buss. Emergency stop wiring shall be as shown on approved shop drawings.

1. Universal Maintenance Pendant

- a. The Universal Maintenance Pendant shall be a handheld controller that can be used by:
 - i. Installers during installation, to slowly jog pipe battens up and out of the way until final commissioning of the control system can be scheduled.
 - ii. End users for maintenance and/or backup control of hoists in the control system.
 - iii. Authorized manufacturer's field service engineers for validation requirements during commissioning and maintenance.
- b. Integrated into the maintenance pendant shall be a feature which allows the field service engineer to quickly demonstrate the hoist's ability to limit the travel distance between the "Normal" limit switch and the "Ultimate" limit switch to a distance of not more than 6-inches (150mm) without the need for hand tools or field wiring.
- c. The maintenance pendant shall be compatible with one or all of Daktronics Pro, E and S Series control systems as needed.
- d. Product features shall include but not be limited to:
 - i. "Normal" and "Ultimate" limit switch feedback/validation.
 - ii. User and installer functions shall include: jog up/down, load feedback and an extensive range of diagnostics.
 - iii. Password protected factory functions shall include limit switch validation, homing routine, and "Ultimate" limit bypass features.
 - iv. Hard wired Emergency Stop with visual recognition.
 - v. Password protected access to advanced, factory levels functions.
- e. A 4-inch (102mm) color touch screen shall be used to navigate through the software and setup movements.
- f. Modbus communication shall be utilized for this function and must have the ability to quickly connect to any hoists controller without the need for hand tools.
- g. Furnish complete with a 15'-0" (4.5M) control/power cable with mating 10-pin female connector.

3.04 EQUIPMENT LABELS AND MARKINGS

A. Pipe Battens:

1. Provide minimum 1½” tall field applied white set number labels at the top and underside of each pipe at each end, just onstage of the plastic end caps. Hand numbering is not permitted.
2. Provide a 1” wide yellow enamel paint stripe at the stage centerline.
3. Provide a 1” wide white enamel paint stripe on either side of plumb lift line attachments to the battens.

C. Counterweight Arbors

1. The front of the arbor TOP AND BOTTOM shall carry 1- ½” field applied white set number labels. Hand numbering is not permitted.
2. Provide labels on the steel back plates showing the proper locations for the spreader plates (max 2’-0” spacing).

3.05 STAGE DRAPERY TRACKS

A. Stage Draperies Heavy Duty Box Tracks

1. ALL TRACK AND COMPONENTS SHALL BE PROVIDED WITH BLACK FINISH.
2. Drapery tracks shall be of 14 gauge black painted galvanized steel, entirely enclosed except for slot in bottom, each half to be in one continuous piece except where splicing clamps are required. Aluminum track is not acceptable for this project.
2. Each drapery carrier shall be spaced on 12" centers and shall be of steel construction with two nylon-tired ball-bearing wheels held to steel body by rustproof nickel plated rivet, such wheels rolling on two separate parallel treads. Each drapery carrier shall consist of a free-moving plated swivel and sufficient trim chain to accommodate drapery snap hook.
3. Live-end pulley and Dead-end pulley blocks shall be adjustable and shall be equipped with minimum 5" diameter sleeve-bearing wheels adequately guarded.
4. A rubber bumper shall be attached to each drapery carrier to function as noise reducer.
5. The manufacturer shall furnish two end stops for placement at each track end and a minimum 5” diameter tension floor pulley for increasing cord tension.
6. Provide the floor pulley with a demountable floor plate. Install floor plate flush into the stage floor as required.
7. Stretch-resistant operating cord shall be black and have a synthetic or wire center and shall be minimum 1/2" diameter.
8. Provide “Back-pack” devices for all cord operated track assemblies.

9. Track shall be rigidly supported from full pipe clamps on five-foot maximum centers.

B. Orchestra Pit Acoustic Drapery Track

1. ALL TRACK AND COMPONENTS SHALL BE PROVIDED WITH BLACK FINISH
2. Track shall be 11 gauge extruded aluminum I-beam construction consisting of a center rib and top, intermediate and bottom flanges.
3. Each curtain carrier shall be spaced on 12" centers and shall be of steel construction to include two nylon-tired ball bearing wheels rolling on two separate parallel treads. Each carrier shall contain a free moving plated swivel to accommodate curtain snap hook. Two rubber bumpers shall be attached to each carrier to function as noise reducers.
4. Track shall be attached to the orchestra pit ceiling on four-foot maximum centers in location as shown in the drawings.

C. Pipe Batten Clamps

1. All drapery tracks shall be suspended below their respective pipe batten by rigid pipe clamps. Under no circumstances shall hanging chains or other methods be used.
2. Pipe clamp supports shall be installed at a maximum spacing of 4'-0" on center.
3. Pipe clamps shall be made of two strips of 12 Ga. by 2" hot rolled steel formed to encompass and clamp the pipe batten to prevent its rotation. Corners shall be rounded.
4. There shall be a 3/8" x 1" hex bolt with lock nut above and below the batten. A 5/8" hole in the bottom of each clamp half shall allow for the attachment of the track hangers.

3.06 STAGE DRAPERIES

- A. Description and Sizes: New draperies shall be as made in accordance with the following schedule and as shown in the drawings:

<u>Description</u>	<u>Qty</u>	<u>Width</u>	<u>Height</u>	<u>Fullness</u>	<u>Fabric Type</u>	<u>Lining</u>
Main Curtain	2	27'-0"	21'-0"	100%	1	No
#2 & #3 Leg Panels	4	10'-0"	20'-0"	Flat	2	No
#1 Leg Panels	2	20'-0"	20'-0"	Flat	2	No
Border Panels	6	55'-0"	8'-0"	Flat	2	No
Traveler Panels	4	29'-0"	22'-0"	50%	2	No
Black Scrim	1	55'-0"	20'-0"	Flat	4	n/a
White Scrim	1	55'-0"	20'-0"	Flat	5	n/a
Cyclorama	1	55'-0"	20'-0"	Flat	6	n/a

<u>Description</u>	<u>Qty</u>	<u>Width</u>	<u>Height</u>	<u>Fullness</u>	<u>Fabric Type</u>	<u>Lining</u>
Orchestra Pit Acoustic Drapes	6	6'-0"	5'-10"	50%	3	No

B. Fabric types:

1. 25 oz KM Fabrics Charisma 100% Polyester IFR Velour. Color: TBD by Architect
2. 25 oz KM Fabrics Charisma 100% Polyester IFR Velour. Color: Black
3. 32 oz KM Fabrics Magic 100% Cotton FR Velour. Color: Black
4. Flame retardant treated 100% cotton sharktooth scrim. Color: Black
5. Flame retardant treated 100% cotton sharktooth scrim. Color: White
6. Base Bid: 100% white FR seamless muslin

Alternate #4: PVC White Plastic – Gerriet’s “Opera”, Rosco “Twin White”, or approved equal

C. Flame Retardance: Fabrics shall be inherently flame retardant meeting the requirements of National Fire Protection Association #701.

D. Fullness: See schedule in Section 3.06.A for fullness of each drapery.

- a. Flat = no extra material.
- b. 50 - 100% = additional fabric included, exclusive of turnbacks and hems.

E. Seams: Seams between strips shall be single stitched without puckers using thread of matching color. All fabrics with a grain or pile shall have all strips running in the “up” direction.

F. Pleats: Pleats shall be box type on 12" centers. Valances and borders (if provided with fullness) are to have their pleats arranged to conceal the seams.

G. Top Finish:

1. 3-1/2" jute webbing shall be double stitched to the top of the drapery with 1" of face fabric turned under the webbing. Brass rustproof #4 grommets shall be inserted in pleat centers (12" centers on flat draperies).
2. The Main Curtain, travelers, legs, side tabs, cyclorama, and any other draperies installed on tracks shall be supplied with plated CCF-2 drapery to carrier snap hooks.
3. Draperies tied directly to pipe battens shall be supplied with 36" braided #4 cotton tie lines. Tie lines shall be black or white to best match the draperies with the centerline in alternate color to aid in hanging draperies.

H. Bottom Hems:

1. All velour draperies and borders shall have 6" bottom hems complete with separate interior chain pockets filled with #8 plated jack chains. Chain pockets shall be stitched so that the

chain will ride 2" above the finished bottom edge of the drapery. LEAD WEIGHT TAPE SHALL NOT BE PERMITTED.

2. Auditorium Stage Cyclorama and Scrim bottom finish:
 - a. Provide a separate, permanent 6" pocket, open at each end, and with access slits every 10'-0" to allow the insertion of 3/4" ID pipe, threaded and coupled.

I. Side Hems:

1. The Main Curtain and travelers shall have a minimum 1/2 width of face fabric turned back at the leading edge.
2. All other side hems shall be a minimum of 4".

J. Labels: Labels shall be affixed to the bottom of each piece on an offstage end identifying compliance with NFPA 701 flame retardancy requirements, piece size, manufacturer's name, address and phone number, and date of manufacture.

K. Storage Bags: Provide natural heavy duty canvas storage bags for all supplied draperies, except for the Orchestra Pit Acoustic Drapery and the PVC Cyclorama. Each bag shall be provided with a draw-string closure and shall be permanently labeled with the drapery name, color, and size.

3.07 SYSTEM SIGNAGE

A. System Sign: Provide and install two (2) system informational signs. The signs shall be installed at the stage left area in sight of the locking rail, and at the upstage wall of the loading gallery. The signs shall describe the following:

- a. Maximum hoist and manual counterweight lineset capacities
- b. Individual weight of each size of counterweight supplied
- c. Maximum load at single lines (i.e. loftblock locations)
- d. Name, address, and phone number of installation contractor
- e. Name, address, and phone number of equipment manufacturer
- f. Date of installation (month and year)
- g. Statement - "Stage rigging system must be inspected yearly by qualified personnel"

B. Operational Warning Sign: Provide and install two (2) signs at the stage right and left areas in sight of the hoists controls and locking rail stating "STAGE RIGGING OPERATION BY AUTHORIZED AND TRAINED PERSONNEL ONLY" in minimum 1-1/2" high lettering.

C. Fall Protection Use Signage:

1. Provide and install one (1) Fall Protection Use sign. The sign shall be installed at the loading gallery in plain sight. The sign shall state the following in letter no less than 1" high:

CAUTION

FALL PROTECTION MUST BE USED
WHEN LOADING OR UNLOADING
COUNTERWEIGHT ARBORS.

IF YOU HAVE NOT BEEN TRAINED
IN THE PROPER USE OF THIS SYSTEM
SEE YOUR SUPERVISOR.

D. System Sign Materials and Lettering size:

1. All system signs shall be of minimum 3/16" thick YELLOW non-glare plastic.
2. Lettering shall be BLACK in color in a non-serif font, such as Helvetica or Arial, in ALL CAPS, and in font sizes as specified herein.
3. Signs shall be mechanically affixed to the walls. Glued applications are not permitted.
4. Signs shall be professionally produced. No hand or "stick on" lettering is permitted.
5. Standard manufacturers' system signage may be used IN ADDITION to the specified signage, but are not acceptable substitutions for the signage described above.
6. Standard manufacturers' Fire Safety Curtain system signage is acceptable, provided it meets all applicable local code and ANSI E1.22 requirements.

4.00 EXECUTION

4.01 INSTALLATION

- A. Storage: The Theater Equipment Contractor shall be responsible for storage of stage equipment, tools, and its equipment during the period of the installation.
- B. Damage Protection: The Stage Rigging Contactor shall take all precautions necessary to prevent damage to the stage floor, walls, and all other existing finishes during installation.
- C. Installation Personnel:
 1. All specified equipment shall be installed by fully trained superintendents and workers.
 2. The Theater Equipment Contractor shall provide a field supervisor who is ETCP (Entertainment Technician Certification Program) certified as a Theater Rigger.
- D. Installation practices:
 1. Installation practices shall be in accordance with Federal OSHA Safety and Health Standards and all local codes. Certified welders shall perform all field welding in full compliance with the latest edition of the Structural Welding Code (ANSI/AWS D1.1) and any other applicable local and state codes and regulations.

2. Equipment shall be installed in a workmanlike manner, per plans and specifications. Equipment shall be aligned, adjusted, and trimmed for the most efficient operation, the greatest safety and for the best visual appearance.
- E. Field Welding: All proposed field welding shall be described and submitted in detail in the form of sketches and/or drawings for review by the Architect/Engineer of Record/Engineer of Record.
- F. Touch-Ups: Any welds or cuts shall be touched up to match disturbed finishes. All finishes which are disturbed during shipping and installation shall be touched up to match the original.

4.02 CLEANUP AND PROTECTION

- A. Site Clean Up and Other Protection: The Theater Equipment Contractor shall be responsible for all clean up related to its work, including the removal of packing materials etc. and the protection of existing surfaces or equipment. Repairs to damage caused by the Theater Equipment Contractor to any item or surface are the sole responsibility of the Theater Equipment Contractor.
- B. Protection of Installed Equipment: The equipment described in this section is considered to be finished equipment and is to be protected during and after installation from excessive dirt and damage caused by other work.
- C. Equipment Cleaning: All equipment and the areas around the equipment shall be cleaned prior to final inspection and acceptance.

5.00 INSPECTION, TESTING, AND OWNER TRAINING

- A. Progress Inspections: During the installation of equipment the Theater Equipment Contractor shall arrange for access as necessary for inspection of equipment by the Architect and/or the Consultant upon reasonable timely notice.
- B. Special Testing: If specifications, the Architect, laws, ordinances, or any public authority require any work to be specially tested or approved, the Theater Equipment Contractor shall give the Architect timely notice of its readiness for inspection, and of dates of inspections to be made by other authorities.
- C. Compliance Inspection, Systems Commissioning, and Testing:
 1. Upon completing the installation of all equipment specified under this section, the Theater Equipment Contractor shall notify the Architect, who will schedule an inspection.
 2. At the time of inspection, the Theater Equipment Contractor shall furnish sufficient workers to operate all equipment and to perform such adjustments and tests as may be required by the Architect and/or their Consultants.
 3. Any equipment, which fails to meet with approval, shall be repaired or replaced with suitable equipment. If determined by the Architect, the inspection may be re-scheduled and held under the same conditions as specified herein.

4. Any additional costs incurred by the Architect their Consultants due to inspection re-scheduling because the work is incomplete or defective, shall be borne by the Theater Equipment Contractor.
5. At the time of these inspections, no other work shall be performed in the auditorium and stage areas.
6. All temporary bracing, scaffolding, etc. shall be removed to permit full operation of, and access to, all equipment.
7. Final approval will be withheld until all systems have been thoroughly tested and found to be in first class operating condition in every particular.
8. Upon completion and approval of the work, the Stage Rigging Contactor shall remove all tools, excess supplies, and trash from the work areas. Any equipment supplied under this section, but not installed, shall be inventoried, cleaned, organized, and turned over to the Owner. The Theater Equipment Contractor shall leave the stage and all work areas in a “broom clean” condition.

D. Owner Training And Manuals

1. Upon completion of the work, the Theater Equipment Contractor shall submit detailed Operations and Maintenance Manuals including as-built shop drawings, equipment descriptions, any required certificates or warranties, and parts lists. Submit in quantities as required by the Architect.
2. Provide “hard” copies of Operations and Maintenance Manuals for the Owner, Architect/Engineer of Record and Consultants. The Theater Equipment Contractor shall also provide CD-ROM’s of any and all CAD drawings or other electronically produced submittal items. Submit in quantities and file formats as required by the Architect.
3. The Theater Equipment Contractor shall fully review all system and equipment manuals with operating and maintenance personnel designated by the Owner and/or Architect. The Contactor shall also demonstrate and fully explain the maintenance and safe use and operation of all systems and equipment included in this section. The Theater Equipment Contractor shall notify the Owner, Architect, and Theater Consultant of the time and place of this training, no later than two weeks in advance.

END OF SECTION 116133

SECTION 12 34 00
LAMINATE CLAD CASEWORK

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 1000, 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.
- B. Fixed modular laminate clad casework and components.

1.02 RELATED SECTIONS

- A. Section 06100: Blocking within walls where indicated.
- B. Division 9: Base molding.
- C. Section 12 3600: Countertops and backsplashes.

1.03 DEFINITIONS

- A. Identification of casework components and related products by surface visibility.
 - 1. Open Interiors: Any open storage unit without solid door or drawer fronts, units with full glass insert doors and/or acrylic doors, and units with sliding solid doors.
 - 2. Closed Interiors: Any closed storage unit behind solid door or drawer fronts.
 - 3. Exposed Ends: Any storage unit exterior side surface that is visible after installation.
 - 4. Other Exposed Surfaces: Faces of doors and drawers when closed, and tops of cabinets less than 72 inches above furnished floor.
 - 5. Semi-Exposed Surfaces: Interior surfaces which are visible, bottoms of wall cabinets and tops of cabinets 72 inches or more above finished floor.
 - 6. Concealed Surfaces: Any surface not visible after installation.

1.04 QUALITY ASSURANCE

- A. Manufacturer: Minimum of 5 years experience in providing manufactured casework systems for similar types of projects, produce evidence of financial stability, bonding capacity, and adequate facilities and personnel required to perform on this project.
- B. Manufacturer: Provide products certified as meeting or exceeding ANSI-A 161.1-2000 testing standards.

1.05 SUBMITTALS

- A. Comply with Section 01 3000, unless otherwise indicated.
- B. Product Data: Manufacturer's catalog with specifications and construction details.
- C. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.
 - 1. Include section drawings of typical and special casework, work surfaces and accessories.
 - 2. Indicate locations of plumbing and electrical service field connection by others.
- D. Component samples: Two sets of samples for each of the following:
 - 1. Decorative laminate color charts.
 - 2. PVC edgings.

1.06 PRODUCT HANDLING

- A. Deliver completed laminate clad casework, countertops, and related products only after wet operations in building are completed, store in ventilated place, protected from the weather, with relative humidity range of 25 percent to 55 percent.

- B. Protect finished surfaces from soiling and damage during handling and installation with a protective covering.

1.07 JOB CONDITIONS

- A. Environmental Requirements: Do not install casework until permanent HVAC systems are operating and temperature and humidity have been stabilized for at least 1 week.
 - 1. Manufacturer/Supplier shall advise Contractor of temperature and humidity requirements for architectural casework installation areas.
 - 2. After installation, control temperature and humidity to maintain relative humidity between 25 percent and 55 percent.
- B. Conditions: Do not install casework until interior concrete work, masonry, plastering and other wet operations are complete.

1.08 WARRANTY

- A. All materials and workmanship covered by this section will carry a five (5) year warranty from date of acceptance.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

- A. Approved Manufacturers:
 - 1. Basis of specification: TMI Systems Design Corporation.
 - 2. LSI
 - 3. Case Systems
- B. Substitution: See Section 01600 . Other manufacturers shall comply with the minimum levels of material and detailing indicated on the drawings or as specified.
 - 1. Subject to compliance with the specifications, the following manufacturers are approved:
 - a. Stevens Industries, Inc.
 - b. Mastercraft, Inc.

2.02 MATERIALS

- A. BASE BID : Core Materials:
 - 1. Certified Particleboard: SCS Certified 100% pre-consumer recycled wood fiber particleboard with no Urea Formaldehyde added during the manufacturing process.
 - a. Up to 7/8 inch thick: Industrial Grade average 47-pound density meeting ANSI A 208.1-1999, M-3 requirements.
 - b. 1 inch thick: Industrial Grade average 45-pound density meeting ANSI A 208.1-1999, M-2 requirements.
 - c. MR Moisture Resistant Particleboard: Average 47-pound density particleboard, ANSI A208.1 1-1999, M-3.
 - 2. Medium Density Fiberboard 1/4 inch thick: Average 54-pound density grade, ANSI A208.2.
- B. Decorative Laminates: GREENGAURD 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 laminate, NEMA Test LD 3-2005, color matched with White.

- C. Laminate Color Selection: Maximum 1 color per unit face and 4 colors per project. (See Color Selection in section 3.06).
- D. Edging Materials:
 - 1. 3mm PVC banding, machine applied and machine profiled to 1/8 inch radius.

2.03 CABINET HARDWARE

- A. Hinges:
 - 1. Five knuckle, epoxy powder coated, institutional grade, 2-3/4 inch overlay type with hospital tip. 0.095 inch thick. ANSI-BHMA standard A156.9, Grade 1.
 - a. Doors 48 inches and over in height have 3 hinges per door.
 - b. Magnetic door catch with maximum 5 pound pull provided, attached with screws and slotted for adjustment.
- B. Pulls:
 - 1. Door and drawer front pulls are rectangular, semi-recessed, injection molded plastic, screw fastened. Pull design shall comply with the Americans with Disability Act (ADA).
 - 2. Stainless Steel Wire Pulls (4 inch).
- C. Drawer Slides:
 - 1. 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.
- D. Adjustable Shelf Supports:
 - 1. Injection molded transparent polycarbonate shelf supports friction fit into cabinet end panels and vertical dividers, adjustable. Shelf support have minimum 2 integral support pins to interface pre-drilled holes, and to prevent accidental rotation of support. The support shall adapt to 3/4 inch or 1 inch thick shelving and provides non-tip feature for shelving. Supports may be field fixed if desired. Structural load to 1200 pounds (300 pounds per support) without failure.
- E. Locks:
 - 1. Removable core, disc tumbler, cam style lock with strike. Lock for sliding 3/4 inch thick doors is a disc type plunger lock, sliding door type with strike.
 - 2. Elbow catch or chain bolt used to secure inactive door on all locked cabinets.

2.04 FABRICATION:

- A. Fabricate casework, countertops and related products to dimensions, profiles, and details shown.
- B. All casework panel components sized/cured to be precisely finished in size and squareness to within 0.010 inches, ensuring strict dimensional quality and structural integrity in the final fabricated product.
- C. Cabinet Body Construction:
 - 1. Tops and bottoms shall be glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals.
 - a. Tops, bottoms and sides of all cabinets are particleboard core.
 - b. Tops, bottoms and sides of sink base units are moisture resistant 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.

3. Fixed base and tall cabinets shall have factory mounted bases of 3/4 inch thick exterior grade plywood. Base is nominal 4 inch high unless otherwise indicated on the drawings.
 4. Base units, except sink base units: Full sub-top. 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. 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.
 7. Adjustable shelf core: 3/4 inch thick particleboard up to 36 inches wide, 1 inch thick particleboard over 36 inches wide.
 - a. Front edge: 1mm PVC.
 8. Interior finish, units with open Interiors:
 - a. Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with VGS high-pressure decorative laminate.
 9. Interior finish, units with closed Interiors:
 - a. Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with thermally fused melamine laminate.
 10. Exposed ends:
 - a. Faced with VGS high-pressure decorative laminate.
 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.
- D. Drawers:
1. Sides, back and sub front: Minimum 1/2 inch thick particleboard, laminated with thermally fused melamine doweled and glued into sides. Top edge banded with 3mm PVC.
 2. Drawer bottom: Minimum 1/2 inch thick particleboard laminated with 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 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.
- E. Door/Drawer Fronts:
1. Core: 3/4 inch thick particleboard except at sink units which is 3/4 inch thick moisture resistant particleboard.
 2. Provide double doors in opening in excess of 24 inches wide.
 3. Faces:
 - a. Exterior: VGS High-pressure decorative laminate.
 - b. Interior: High-pressure cabinet liner CLS.
 4. Door/drawer edges: 1mm PVC, external edges and outside corners machine profiled to 1/8 inch radius.
- F. Miscellaneous Shelving:
1. Core material: 3/4 inch or 1 inch thick particleboard.
 2. Exterior: VGS High-pressure decorative laminate.

3. Edges: 3mm PVC, external edges and outside corners machine profiled to 1/8 inch radius.

PART 3- EXECUTION

3.01 INSPECTION:

- A. The casework contractor must 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.

3.02 PREPARATION:

- A. Condition casework to average prevailing humidity conditions in installation areas prior to installing.

3.03 KEYING:

- A. Key alike by room, unless otherwise instructed.
- B. Provide locks for each cabinet.

3.04 INSTALLATION:

- A. Erect casework, plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and cut for accurate fit.
- B. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind.
 1. Install drawer pulls horizontally.
 2. Install door pulls vertically.
- C. Repair minor damage per plastic laminate manufacturer's recommendations.
- D. Install countertop and backsplash.
 1. Scribe and cut for accurate fit to wall and under window stools.
 2. Coordinate openings with grilles supplied in Section 06200.
 3. Provide 1 inch overhang at countertop over lockers.

3.05 CLEANING:

- A. Remove and dispose of all packing materials and related construction debris.
- B. Clean cabinets inside and out. Wipe off fingerprints, pencil marks, and surface soil etc., in preparation for final cleaning by the building owner.

3.06 COLOR SELECTION:

- A. Laminate Color Selection: From Formica, Nevamar and Chem Metal stock colors.
- B. Hinge and Pull Color Selection: From manufacturer's standard
- C. Miscellaneous Hardware Color Selection (support brackets, table frames, rail): From manufacturer's standard.
- D. 1mm PVC Edge Banding Color Selection: From manufacturer's standard of colors matching decorative laminate.
- E. 3mm PVC Edge Banding Color Selection: Match decorative laminate color selection.

END OF SECTION

SECTION 12 36 00
COUNTERTOPS AND BACKSPLASHES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Countertops and backsplashes.
- C. Countertops for manufactured casework.
- D. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 05 5500 - Metal Fabrications: Countertop support brackets.

1.03 REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard; 2009.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.
- D. ISSFA-2 - Classification and Standards for Solid Surfacing Material; International Solid Surface Fabricators Association; 2001 (2007).
- E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- F. PS 1 - Structural Plywood; 2009.

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. 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. Installation Instructions: Manufacturer's installation instructions and recommendations.
- H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Same fabricator as for cabinets on which tops are to be installed.
- B. Installer Qualifications: Fabricator.

1.06 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.

1.07 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 COUNTERTOP ASSEMBLIES

- A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI Architectural Woodwork Standards.
- B. Plastic Laminate Countertops: High pressure decorative laminate sheet bonded to substrate.
 - 1. Laminate Sheet, Unless Otherwise Indicated: NEMA LD 3 Grade HGS, 0.048 inch nominal thickness.
 - a. Finish: Matte or suede, gloss rating of 5 to 20.
 - b. Surface Color and Pattern: As scheduled.
 - c. Manufacturers:
 - 1) Formica Corporation : www.formica.com.
 - 2) Wilsonart International, Inc : www.wilsonart.com.
 - 3) Substitutions: See Section 01 60 00 - Product Requirements.
 - 2. Exposed Edge Treatment: Molded PVC edge with T-spline, sized to completely cover edge of panel.
 - 3. Back and End Splashes: Same material, same construction.
 - 4. Wall Protection above Backsplash: Same sheet material without substrate, adhered directly to wall surface as shown.
- C. Wood Countertops: One-piece, glued-laminated under pressure.
 - 1. Thickness: 1-1/4 inch, minimum.
 - 2. Construction (Butcher Block): Maximum 1/2 inch thick strips glued perpendicular to surface.
 - 3. Species: Maple; clear grade.
 - 4. Exposed Edges: Rounded to approximately 3/8 inch radius.
 - 5. Back and End Splashes: Same material, same construction; 3/4 inch thick, square edges.
 - 6. Finish: Sanded smooth; two coat boiled linseed oil rubbed in with 48 hours between coats.
- D. Solid Surfacing Countertops and Thresholds: Solid surfacing sheet or plastic resin casting over continuous substrate.
 - 1. Flat Sheet Thickness: 1/2 inch, minimum.
 - 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISSFA-2 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. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - b. Color and Pattern: As indicated on drawings.
 - c. Manufacturers:
 - 1) Formica Corporation : www.formica.com.

- 2) Substitutions: See Section 01 60 00 - Product Requirements.
3. Other Components Thickness: 1/2 inch, minimum.
4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge .
5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
6. Wall Protection above Backsplash: Same sheet material without substrate, adhered directly to wall surface as shown.
 - a. Thickness: 1/4 inch.
7. Thresholds: As indicated on drawings.

2.02 ACCESSORY MATERIALS

- A. Wood-Based Components:
 1. Wood fabricated from old growth timber is not permitted.
 2. Provide sustainably harvested wood, certified or labeled.
- 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. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf minimum density; minimum 3/4 inch thick; join lengths using metal splines.
- D. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- E. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.03 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 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 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.
- C. Attach wood countertops using screws with minimum penetration into substrate board of 5/8 inch.
- D. Seal joint between back/end splashes and vertical surfaces.

3.02 CLEANING

- A. Clean countertops surfaces thoroughly.

3.03 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

3.04 SCHEDULES

END OF SECTION

SECTION 12 61 16
FIXED AUDIENCE SEATING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. Provide all material, labor, equipment and services and perform all operations necessary or required for the work of the section, in accordance with Drawings and Specifications, and including fabrication and installation of fixed audience seating.

1.02 SUMMARY

- A. Deliver and install fixed padded and upholstered chairs as specified, floor mounted, with self-lifting seat which rises to a uniform 3/4 safety fold position.

1.03 COORDINATION

- A. Do not deliver or install seating until space is free of lifts and/or scaffolding used by other trades which may interfere with installation and/or damage seating.
- B. Coordinate concrete requirements needed for proper installation.

1.04 ACTION SUBMITTALS

- A. Product data for each chair model specified to include construction details, material descriptions and finish options
- B. Seating layout (shop drawings) developed from the contract drawings which show aisle widths, chair spacing for each row, row-lettering and chair-numbering scheme, chair dimensions and back pitch. Layout drawings to also include locations for accessories, electrical devices, accessibility provisions and attachments to other work.
- C. Samples for verification & finish selection to include:
 - 1. Finish selections to be made from manufacturer's standard color and fabric guides.
- D. Maintenance instructions and inspection guidelines furnished for each chair model specified.
- E. Manufacturer's standard warranty.

1.05 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.06 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. Obtain each type of fixed seating required, including accessories and mounting components, from a single manufacturer.
 - 2. Obtain fabric of a single dye lot for each color and pattern of fabric required except when yardage requirement exceeds maximum dye lot. Multiple dye lots shall be color matched for quality assurance.
- B. Fire Performance Characteristics of Upholstered Seating:
 - 1. Fabric shall be Class 1 according to DOC CS 191 and 16 CFR 1610.61, tested according to California Technical Bulletin 117.
 - 2. Padding shall comply with California Technical Bulletin 117.

1.07 PROJECT CONDITIONS

- A. Environmental Limitations:

1. Do not deliver or install seating until spaces are enclosed and weather tight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary or permanent HVAC system is operating and maintaining ambient temperature and humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements:
 1. Take field measurements to verify or supplement dimensions indicated on contract drawings prior to manufacturing.

1.08 WARRANTY

- A. Provide a manufacturer's warranty covering the material and workmanship for the specified warranty period from date of final acceptance.
- B. Warranty Periods:
 1. Structural Components: five years.
 2. Operating Mechanisms: five years.
 3. Plastic, Wood and Painted Components: five years.
 4. Upholstery Fabric: one year.
 5. Electrical components: one year.

PART 2 PRODUCTS

2.01 MATERIALS AND FINISHES

- A. Steel shall meet requirements for ASTM A 36/A 36M plates, shapes, and bars; ASTM A 513 mechanical tubing; ASTM A 1008/A 1008M cold-rolled sheet; and ASTM A 1011 hot-rolled sheet and strip.
- B. All exposed metal parts shall be powder coated. The powder coat finish shall be applied by electrostatic means to a thickness of 2 - 5 mils. Manufacturer's standard color range shall be used.
- C. Exposed plywood shall meet requirements for HPVA HP-1, Face Grade A, hardwood veneer core with color-matched hardwood-veneer faces, made with adhesive containing no urea formaldehyde.
 1. Hardwood lumber and veneer faces shall be maple selected to be free of visible defects. Exposed wood shall be sanded smooth and stained to color selected with low-VOC water-based stain and top coat to provide with a high quality finish. Color to be chosen from manufacturer's standard offering.
- D. Plastic Laminate shall meet requirements NEMA LD 3, Grade VGS for vertical surfaces and Grade HGS. Color and pattern to be chosen from manufacturer's standard offering.
- E. Fabric: Shall meet Class 1 flammability requirements of the U.S. Department of Commerce Commercial Standard 191-53 per Bulletin #117 (California Code).
- F. Upholstery padding shall be molded or slab polyurethane foam.
- G. Molded Plastics:
 1. Structural components shall be mar and dent resistant high density glass-filled polypropylene with UV stabilizers
 2. Decorative components shall be mar and dent resistant high density polyethylene (HDPE) with UV stabilizers.
 3. Plastic components shall be chosen from manufacturer's standard offering.

2.02 MANUFACTURERS

- A. Manufacturers:
 1. Approved Manufacturer shall furnish list of at least 5 similar school projects with chairs installed for a minimum of 5 years.

2. Manufacturer shall have been in business for a minimum of 15 years with at least 10 years of experience in manufacturing auditorium type seating similar to specifications.

2.03 FIXED AUDITORIUM SEATING

- A. Basis-of-Design: Seating Concepts LLC; Product: BW-220, Contour.
- B. Chair Mounting Standards
 1. Center standards: Pedestal design with a 1" x 3" rectangular 16 gauge steel tube attached by concealed weld to a 3-1/4" x 8" 14 gauge deep formed steel foot with four holes for attachment of the standard to a concrete floor with lead shielded expansion bolts.
 2. Seat pan attachment: 1/4" steel bracket integrated into the standard at mid point.
 3. Anchor for seat pan to standard: 5/16" hexagon fusion nut and hexagon bolt of 5/16" x 3/4" through a threaded insert on the steel seat bracket.
 4. Back attachment: 14 gauge sheet metal lug support.
 5. Armrest attachment: 16 gauge plate welded to the top of the column.
 6. Aisle standards: Oval, fabricated same as the center standards with 20 gauge steel frame welded to the column to accept an end panel.
 7. End Panel: laminated plastic, upholstery or with the finish to be selected by architect.
 8. End panels to be furnished as shown on seating plan.
- C. End Aisle Panels:
 1. Oval design.
 2. LED aisle light.
- D. Armrests:
 1. Armrests: solid hardwood, stained to a finish, all as specified fastened with four lag screws of cold-rolled galvanized steel 1/8" x 19/32".
 2. The armrest for the center standards shall be substantially similar in size to the aisle standard armrests.
- E. Chair Backs
 1. Chair back padding: cold molded polyurethane foam of 2" thickness at the top increasing to 3" at the bottom of the back.
 2. The foam shall be cemented to 5 ply 7/16" plywood base with four 1/4" threaded inserts for the attachment of two die formed metal supports (back wings), 14 gauge, with four cold-rolled galvanized flat head steel screws 1/4" by 3/4".
 3. Alternate: The outer back shall be surfaced with veneer.
 4. All attachment screws shall be fully concealed.
 5. Back wings shall have provision for 16 degree, 20 degree or 24 degree pitch.
 6. Overall height of the chair from floor to top of the back is a minimum 34" as measured in the 20 degree back pitch.
- F. Seats:
 1. Seat cushion: Arch-spring type.
 2. Frame: One piece reinforced injection molded polypropylene.
 3. Serpentine springs: normalized 10 gauge steel epoxy painted, covered by a chafing barrier inter-liner
 4. Seat cushion: Cold molded to the contour of the springs to provide raised outer edge
 5. foam density: 3.4 +/- 0.2
 6. Seat frame hinge: 14 gauge 7/8" diameter cold rolled steel hinge rod.
 7. Flanges for attachment to the standards: 7 gauge steel.
 8. Stops: stamped-died from 9 gauge steel and are filled with high impact resistance neoprene rubber.

9. High resistant nylon bushings are used at the pivot points to prevent metal to metal contact.
 10. The specified fabric: panel side construction and manufactured as a slip cover with a draw string application.
 11. The slip cover fits over the entire assembly in order to allow ease in replacement.
 12. Self lifting mechanism: counter balance system integrated within the seat frame and which utilizes a weight inserted into the interior of the seat frame which allows the seat pan to return to a 75 or 90 degree vertical position by means of gravity.
 13. Stops: two ½” square tube stops, two counter-stops and two 1” cold rolled steel bushings, all reinforced.
 14. Enclose seat frame and return mechanism with injection molded polypropylene cover with a decorative embossment or wood veneer/laminate surfaced over ply wood cover and attaches to the frame without screws or other fasteners but which can be removed with the use of a specially supplied tool.
 15. The rear of the seat pan shall be vented to allow the foam to breathe.
- G. Chair width shall vary to accommodate row lengths.
- H. Back height and pitch shall be fixed as shown on seating layout drawings.
- I. Fabric
1. Basis-of-Design: Guilford of Maine
- J. Accessories
1. Number and letter plates (Manufacturer Standard Rectangular Size: 11/16” X 1 5/8”, Brass or Silver)
 2. Swing away ADA aisle standard
 3. Aisle lights (concealed or external mounted, incandescent or LED)
 4. Perforated seat pan
- K. Accessible Seating:
1. Shall be designated on the seating layout drawings and designed to allow an individual to transfer from a wheelchair to the theatre chair.
 2. The aisle standard shall be equipped with an armrest capable of lifting to a position parallel with the support column, opening sideways access to the seat.
 3. Aisle standards so equipped shall be provided with a label, displaying an easily recognizable "handicapped" symbol.
 4. Decorative requirements of aisle standards are waived for the handicapped access standards.
- L. Extra Materials:
1. Furnish extra materials from the same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 2. Provide 10 yards of additional fabric (5 yards of each color).
 3. Replacement Seat and Back Covers: A quantity of cut and sewn seat and back upholstery covers shall be provided. Covers shall be pro-rated according to sizes & colors of chairs in the seating layout. Quantity of covers to be provided shall be sufficient to re-upholster 5% of the chairs.
- M. Fabrication:
1. Manufacture fabric-covered cushions with molded padding beneath fabric and with fabric covering free of welts, creases, stretch lines, and wrinkles. For each upholstered component, install pile and pattern run in a consistent direction.
 2. Fabricate floor attachment plates to conform to floor slope.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Prior to layout and installation examine floors, risers, and other adjacent work and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the work including, but not limited to, plumb of riser faces and concrete conditions.
- B. Examine locations of electrical connections.
- C. Examine locations of HVAC supply ducts.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install seating in locations indicated and fastened securely to substrates according to manufacturer's written installation instructions.
- B. Use installation methods and fasteners that produce fixed audience seating assemblies with individual chairs capable of supporting an evenly distributed 600-lb static load applied 3" from front edge of the seat without failure or other conditions that might impair the chair's usefulness.
- C. Install seating with chair end standards aligned from first to last row and with backs and seats varied in width and spacing to optimize sightlines.
- D. Install chairs in curved rows at a smooth radius.
- E. Install seating so moving components operate smoothly and quietly.

3.03 ADJUSTING

- A. Adjust chair backs so that they are properly aligned with each other.
- B. Adjust self-rising seat mechanisms so seats in each row are aligned when in upright position.
- C. Verify that all components and devices are operating properly.
- D. Repair minor abrasions and imperfections in finishes with coating that matches factory-applied finish.
- E. Replace upholstery fabric damaged during installation.

3.04 CLEANING

- A. All debris caused by this work shall be removed from the auditorium and other work areas, and the areas left clean and free of debris. Cardboard from cartons shall be broken down into manageable piles and stacked neatly in the designated trash collection area on site.

END OF SECTION

SECTION 14 42 00
VERTICAL PLATFORM LIFT

PART 1 GENERAL

1.01 SUMMARY

- A. Refer to Scope Information Sheets for this contract bound in the Project Manual under Section 01 10 00, 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.
- B. The product is a vertical platform lift designed for indoor applications. The operating system is composed of the tower and the lifting platform.
- C. Lifts shall be in accordance with local codes and regulations.

1.02 QUALITY ASSURANCE

- A. Subcontractor Qualifications:
 - 1. Skilled tradesmen must be employees of the installing contractor approved by the lift manufacturer, with demonstrated ability to perform the work on a timely basis.
- B. Manufacturer:
 - 1. Company with not less than 10 years of experience in the design, fabrication and assembly of platform lifts.

1.03 SUBMITTALS

- A. Product Data: Capacity, physical dimensions and operation instructions.

PART 2 PRODUCTS

2.01 AERIAL WORK PLATFORM

- A. Product: Genie Model AWP-25S.
 - 1. Length: 9'-1" - 10'-8"
 - 2. Width: 3'-2"
 - 3. Lift Capacity: 350 lbs.
 - 4. Power: 110V/50-60 Hz AC power.
 - 5. Adjustable Base: Super Straddle AWP 25S.

PART 3 EXECUTION

3.01 INSTALLATION:

- A. Trained employees of the lift contractor shall perform all installation work of this section.
- B. Adjust lift for proper operation and clean unit thoroughly.
- C. Instruct users and owner's maintenance personnel in proper troubleshooting and maintenance procedures.

END OF SECTION

SECTION 22 00 00

GENERAL PROVISIONS – PLUMBING/FIRE PROTECTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and all other applicable Divisions, apply to work of this Section.
- B. This specification or drawing and the design features or resulting construction disclosed, are the property of Furlow Associates, Inc., and shall not be reproduced without written permission.
- C. All fire protection suppression systems shall be part of and included in all of the following 220000 thru 220191 Sections.

1.2 WORK INCLUDED

- A. Provide labor, materials, equipment and supervision necessary to install complete operating Plumbing and Fire Protection Systems as indicated the drawings and specified herein, including all work at the site and within the proposed construction areas to accomplish the required work.

1.3 REGULATIONS, CODES AND STANDARDS

- A. Work shall be performed in accordance with latest adopted codes, regulations and ordinances by authorities having jurisdiction. Observe all safety regulations.
- B. Latest editions of any referenced standards shall govern.
- C. Obtain all municipal and/or the Authorities Having Jurisdiction permits and inspection certificates and pay all charges.
- D. Make or arrange for any/or all inspection agency reviews or visits and pay all charges. This includes communication with each respective agency and/or utility to verify the project system work, coordination responsibilities, fees, back charges, etc., required.
- E. All fees and back charges shall be verified during the bidding phase of the work. Any discrepancy of this item between any utility, inspection agency and the Contractor shall be brought to the attention of the A/E prior to bid opening.
- F. Submission of a bid will be deemed evidence of having complied with these requirements.

1.4 RELATED WORK

- A. Refer to equipment shown or specified in all other applicable Divisions that require Plumbing and Fire Protection services.

- B. Refer to work related to Plumbing and Fire Protection as shown on the following contract drawings:

Architectural & Structural
Electrical

1.5 COORDINATION

- A. The Plumbing and Electrical Contractors are responsible to coordinate all manufacturer's recommended circuit breakers, starters, disconnects and fuse sizes for all equipment. Submission of a shop drawing will certify that this has been completed. Any necessary changes required will be included as part of this contract.
- B. Plumbing and Sprinkler Contractors shall coordinate scheduling, submittals and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of independent work elements, with provisions to accommodate items that may be installed at a later time.
- C. Plumbing and Sprinkler Contractors shall verify utility requirements and all characteristics of operating equipment are compatible with the building utilities. Coordinate the work of all sections related and required for installing, connection and placing in service of all equipment.
- D. Plumbing and Sprinkler Contractors shall coordinate all space requirements, supports and installation of all mechanical, electrical, plumbing and fire protection work, which are indicated diagrammatically on the Drawings. Verify routing of all pipes, ducts, conduits and equipment connections. Maximize accessibility for other work, and service requirements for maintenance and repairs.
- E. Obtain written confirmation from all related trade Contractors and the Owner or his representative that requirements, conflicts and coordination issues have been discussed and resolved.

1.6 SUBMITTALS

- A. Shop Drawings & Product Data:
1. Shop drawings and product data shall be submitted in accordance with Division 22 specifications except where herein modified.

NOTE: Submittals will only be reviewed once and resubmittals will be reviewed once. Any other submittals will be billed to the Contractor at the Engineer's standard rates.

2. Listed are the required shop drawings and reports required for this project. The Engineer/Owner shall reserve the right to require additional submissions not listed below:
 - All fixtures, equipment and associated devices so listed on the Fixture Schedule on Drawing P-100.
 - Insulation
 - All specified piping systems.

- All specified valves.
 - Hanger and supports including Sumner system.
 - Piping labels and identification.
 - Sprinkler System and all related data, devices, switches and trimmings.
 - Testing reports.
 - Sterilization report.
 - Operating/Maintenance manuals.
 - As-Built Drawings.
3. Submittals comprising complete catalog cuts, shop drawings and performance test data for Plumbing materials and equipment as required by other sections of Division 22, shall be submitted for review checking. The Contractor shall review these for conformance to contract documents prior to submission and affix contractor's signature to each submittal certifying that this review has been done. By approving and submitting shop drawings, product data, samples and similar materials, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction data that relates to the work, and has checked and coordinated this information with all of the requirements contained in the contract documents for the work of all trades.
4. All submittals shall have the following identification data, as applicable, contained therein or permanently adhered thereto.
- a. Project name.
 - b. Project number.
 - c. Sub-contractor's, vendor's and/or manufacturer's name and address.
 - d. Product identification.
 - e. Identification of deviation from contract documents.
 - f. Applicable contract drawings and specification section number.
 - g. Shop drawing title, drawing number, revision number, and date of drawing and revision.
 - h. Resubmit revised or additional submittals as requested.
 - i. Wherever shop drawings or vendor's standard data sheets indicate work to be done "by others", it shall be the responsibility of the contractor making the submission to identify by name, the contractor who is to do this work. If the contractor named is other than the contractor making the submission, the shop drawing submission must be reviewed by the named contractor and bear his mark of approval, prior to submission to the Architect/Engineer.
 - j. Where equipment proposed differs from that shown on the drawings or specified, he shall submit for approval drawings showing the manner in which the layout is affected by the substitution.

- k. The Contractor shall keep one copy of approved shop drawings at the job site,, filed in a suitable metal container. The shop drawings shall be cataloged and kept in good repair, and shall be available for use by the Owner, Architect and Engineer.
- l. No equipment shall be ordered, fabricated, etc., before approval of shop drawings.
- B. Contractor is responsible for the shop drawing coordination and interface with the work of other contracts and adjacent work. The relationship of Contractor's work shall be verified as it relates to adjacent and critical features of the work of this and all contracts and materials.

1.7 WARRANTY/GUARANTEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in all other applicable Divisions. In addition, refer to specifications for special guarantees.
- B. Wherever in the specification sections of this division, reference is made to a specific warranty period, this warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the contract documents.
- C. Contractor to include an 11 month "walk-thru" of the building systems with representatives of the School District, Architect, Engineer and the Construction Manager. The purpose is to establish a list of corrective work that relates to operational issues, material/installation deficiencies.

1.8 SITE INSPECTION

- A. The Contractor shall visit the site, inspect, and become aware of all conditions which may affect the work during the estimation phase of his work and prior to bid openings. Investigate utilities, protection requirements for adjacent facilities, storage locations, and access to the construction area.
- B. Submission of a bid will be deemed evidence of having complied with this requirement.

1.9 SUBSTITUTIONS

- A. Whenever a material, article, piece of equipment or system is identified in the following specification or indicated on the drawings by reference to manufacturers' or vendors' names, trade names, catalog numbers or the like, it is so identified for the purpose of establishing the basis of the Bid.
- B. Substitution approval must be obtained and included as an addendum item prior to the submission of the bid. An approved substitution shall not be considered as an approval for the Contractor or an equipment vender to deviate from the written portion of the specifications unless so stated in the addendum.
- C. The drawings illustrate the space allocated for equipment and the Contractor shall install the equipment accordingly. If changes are required in the building or arrangement due to substitution of equipment, the Contractor making the substitution must pay for the necessary modifications.

- D. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements as indicated on all contract documents and as described within the specifications. This shall include, but shall not be limited to space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, then they shall be responsible for any and all additional costs associated with the changes required by other trades.

1.10 LUBRICATION

- A. Furnish, install and maintain all required lubrication of any equipment operated prior to acceptance by the Owner. Lubrication shall be as recommended by the equipment manufacturer.
- B. Provide one year's supply of lubricants to Owner at date of acceptance.
- C. Verify that required lubrication has taken place prior to any equipment start-up.

1.11 EQUIPMENT START-UP

- A. Verify proper installation by manufacturer or his representative.
- B. Advise General Contractor 2 days prior to actual start-up.
- C. Verify proper operation. Obtain signed statement by manufacturer or his representative that equipment is operating within warranty requirements. Submit statement to General Contractor.

1.12 OPERATION & MAINTENANCE INSTRUCTIONS

- A. Properly and fully instruct Owner's personnel in the operation and maintenance of all systems and equipment.
- B. Insure that the Owner's personnel are familiar with all operations to carry on required activities.
- C. Such instruction shall be for each item of equipment and each system as a whole.
- D. Provide report that instruction has taken place. Include in the report the equipment and/or systems instructed, date, contractor, Owner's personnel, vendor, and that a complete operating and maintenance manual has been reviewed.
- E. Manual shall include all instructions on operation, maintenance, repair parts list, lubrication requirements, brochures, catalogue cuts, wiring diagrams, piping diagrams, control sequences, service requirements, names and addresses of vendors, suppliers and emergency contacts. Three manuals shall be provided.
- F. Submit manuals for review prior to operating instruction period. Manuals shall be 8-1/2 x 11" with hard cover, suitably bound.

- G. Provide to the Owner any special tools necessary for operation and routine maintenance of any of the equipment.
- H. Furnish three (3) copies of a professionally taped video and three (3) copies of professionally prepared drawings demonstrating the following:
 - Location of main shut-off valves
 - Procedures for equipment start-up and seasonal shut-downs.
 - Procedures for maintenance.
 - Provide written version of all procedures included in video.

The above should cover all equipment/systems including, but not limited to the following:

- Sprinkler Systems
- Flush valves
- Manual Faucets
- 3-Person Lavatory System

1.13 TOOLS

- A. All equipment furnished by the Contractor which requires special tools or devices other than those normally available to the maintenance or operating staff shall be furnished in duplicate to the Owner, sufficiently marked, packed or boxed for staff usage. The tools provided shall be listed by the Contractor identified as to their use or the equipment applicable in a written transmittal to the Owner.

1.14 CLEANING AND FINISHING

- A. After equipment start-up and all operating tests have been made and the system pronounced satisfactory, each respective Contractor shall go over the entire project, clean all equipment, etc., installed by him and leave in a clean and working condition. Any surfaces found marred after this final cleaning shall be refinished or replaced by each Contractor at no cost to the Owner.
- B. Provide for the safety and good condition of all materials and equipment until final acceptance by the Owner. Protect all materials and equipment from damage. Provide adequate and proper storage facilities during the progress of the work. Special care shall be taken to provide protection for bearings, open connections, pipe coils, pumps, compressors and similar equipment.
- C. All NEW fixtures, piping, finished surfaces and equipment installed shall have all grease, adhesive labels and foreign materials removed.
- D. All new piping installed shall be drained and flushed to remove grease and foreign matter. Pressure regulating assemblies, traps, flush valves and similar items shall be thoroughly cleaned. Remove and thoroughly clean and reinstall all liquid strainer screens after the system has been in operation ten (10) days.
- E. When connections are made to existing systems, the Contractor shall do all cleaning and purging of the existing systems required to restore them to the condition existing prior to the start of work.

- F. Clean-up: Remove from the premises, all unused material and debris resulting from the performance of work under this section.

PART 2 – PRODUCTS

2.1 GENERAL

- A. All material and equipment shall be new and of present day manufacture, and shall conform to accepted standards of the trade where such a standard has been established for the particular type of equipment or material.
- B. Whenever equipment or material is referred to in the singular, such as "the plumbing fixture", it shall be deemed to apply to as many such items as necessary to complete the work.

2.2 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. During loading, transporting and unloading exercise care to prevent damage to material.
- B. Store all materials in dry enclosures or under protective coverings out of way of work progress.
- C. Material shall not be allowed to be stored directly on ground.
- D. Deliver in manufacturer's original cartons or on skids.
- E. Handle and protect so as to prevent damage to product or any surrounding material.

2.3 CONCRETE

- A. Concrete if used on this project, shall be in accordance with Section 033000.
- B. The 28-day minimum compressive strength shall be 3000 psi.

PART 3 – EXECUTION

3.1 PROTECTION

- A. Plug or cap open ends of piping systems.
- B. Stored materials shall be covered to prevent damage by inclement weather, sun, dust or moisture.
- C. Protect all installed work until accepted in place by the Owner.
- D. Plates, polished metal escutcheons and other finished devices shall not be installed until masonry, tile, and painting operations are complete unless otherwise protected.
- E. Protect all work from operations which may cause damage such as hauling, welding, soldering, painting, insulating and covering.

- F. Do not remove protective material until equipment is placed in service.

3.2 WORKMANSHIP

- A. Install all work neat, trim and plumb with building lines.
- B. Install work in spaces allocated.
- C. Cutting and patching shall be performed by skilled tradesmen normally employed for the work involved.

3.3 EXCAVATION

- A. The excavation shall be of the open-trench method and to the depths and widths as may be necessary. The Contractor shall do all excavation required in connection with his work. Bottoms of trenches shall be excavated to a uniform grade. All materials excavated shall be deposited on the side of the trenches and beyond the reach of the slides. Excavated material shall not be piled where it will interfere with traffic. If rock is encountered, it shall be removed by the General Contractor. See provisions in Division 2.
- B. No piping shall be bedded directly on rock. They shall be cushioned by a 6-inch layer of crushed stone or gravel of selected grade, of size to pass through 3/4" mesh sieve. Not less than 30% shall be fine which will pass through a 3/8" mesh sieve.

3.4 SHORING AND PUMPING

- A. The Contractor shall provide all shoring, bracing or sheet piling necessary to maintain the banks of his excavation and shall take out same as the work progresses and filling in has been accomplished. Shoring shall be in accordance with OSHA Standards.
- B. The arrangement of shoring must be such as to prevent any movement of the trench banks and consequent strains on the conduits. Shoring shall be provided to prevent damage to work installed by other trades.
- C. The Contractor shall do all pumping required to keep his excavations free of water. The water shall be conveyed in piping or watertight troughs a sufficient distance that it will flow from the site and not affect other work being performed.

3.5 BACKFILLING

- A. After work in trenches has been completed, they shall be filled with select fill in 8" layers and shall be pneumatically tamped before the next layer of material has been filled in. The backfill shall be free of excavated rock, cinders, stones, brickbats or other debris.
- B. Wherever rock is removed, the Contractor shall secure and fill select clean earth to a minimum depth of 3'-0" above the top of the pipe. Unless otherwise indicated, no rock shall be deposited in the trench fill. This clean earth fill shall be procured other than from the site unless permission for earth borrow from the site is granted by the Architect. If site borrow is permitted, the topsoil removal, relocation and finished grading will be accomplished as directed by the Architect.

- C. Under no circumstances shall excavated material be left where it will interfere with the Owner's or other Contractor's operations.
- D. All earth and other materials taken from the trenches and not required for backfilling shall be deposited where directed, or removed from the premises as directed by the Architect.
- E. Any rock removed from the excavation shall be removed from the project site by the Contractor.
- F. Trenches which pass under wall footings or within 18" of column footings shall be backfilled with lean concrete. To secure adequate foundation support, the method and depositing of the concrete fill shall be as directed by the Architect. To prevent the concrete from adhering to the pipes, necessary pipe protection shall be applied.

3.6 EQUIPMENT SETTING

- A. Furnish and install as a minimum, a 4 inch concrete pad beneath all floor-mounted equipment. Install anchor bolts in pour.
- B. Furnish and install as a minimum, spring vibration isolation under any equipment 10 HP and over and rubber in shear vibration isolation on any equipment up to 10 HP.
- C. Concrete shall be 3,000 psi, 28 day compressive strength in accordance with ACI-613. Reinforce with No. 4 rod 12" on centers both ways or as otherwise detailed.

3.7 FASTENERS, HANGERS AND SUPPORTS

- A. Furnish and install all hangers and supports required to suspend, mount, or hang the work.
- B. Furnish and install all miscellaneous steel angles, channels, beams, clips, brackets and anchors necessary to hang or support the work. Provide submissions for review.
- C. Install concrete inserts before concrete is poured.
- D. Drilled inserts shall not be loaded more than 1/4 rated capacity or 200 pounds.
- E. Power-driven fasteners shall not be allowed for piping larger than 2 inch, or equipment. When used they shall not be loaded more than 1/8 rated capacity or 200 pounds.
- F. All hangers, miscellaneous steel, braces and supports shall be galvanized, cadmium plated, or primed steel. Copper tubing shall be supported with copper hangers. No direct contact of dissimilar metals between the piping system and its hanger support shall be permitted.
- G. Piping shall be supported from adjustable clevis type hangers with insulation pipe saddles. Where hangers are 18" or longer, provide lateral bracing at every fourth hanger. See IPC Pipe Support Table below:

PIPE SUPPORT SPACING

Material	Horizontal Max. Feet	Vertical Max. Feet
ABS Pipe	4	10
Aluminum	10	15
Brass	10	10
Brass Tube up to 1-1/4"	6	10
Brass Tube over 1-1/2"	10	10
Cast Iron	5	15
Copper up to 1-1/4"	6	10
Copper over 1-1/4"	10	10
CPVC Up to 1"	3	10
CPVC Over 1"	4	10
Lead Pipe	Continuous	4
PB Pipe/Tubing	2.6 ft. (32")	10
PVC Pipe	4	10
PEX	2.6 ft. (32")	10
Steel Tubing	8	10
Steel Pipe	12	15

- H. Support vertical piping at floor levels using approved riser clamps. Clamp material shall be compatible with pipe material. Maximum vertical spacing shall be 10'-0".

3.8 SLEEVES

- A. Provide each pipe passing through a masonry or concrete wall, floor or partition with a sleeve made from standard weight steel pipe for pipe with smooth edges, securely and neatly cemented in place. Provide each pipe passing through a frame or metal partition with a sleeve made from No. 22 gauge galvanized sheet metal, securely fastened in place.
- B. Pipe passing through foundation wall or under foundation shall be provided with relieving arch or steel pipe per IPC Section 305.5.
- C. Be responsible for the proper location and alignment of all sleeves.
- D. Provide hydrostatic seals for sleeves passing through outside walls, below grade, or through hydrostatically sealed slabs or floors on grade. Provide fire-rated seals for all other sleeves.
- E. Install both piping and sleeve seals so as to maintain integrity of seals with expansion and contraction of piping.
- F. Set floor sleeves flush with floor surface in finished areas, 1" above the finished floor in kitchens, cafeterias, and similar service areas unless such areas are slab-on-grade; 1" above the floor in mechanical rooms, pipe chases, pipe spaces and other unfinished areas, unless otherwise indicated, and flush with the underside of slabs. Extend wall and partition sleeves through and cut flush with each surface unless otherwise indicated or specified.

- G. Select sleeves two pipe sizes larger than any pipe that is to remain uncovered, unless otherwise required by the sealing method specified. Where pipes are to be covered, provide sleeves large enough to allow the covering to pass through the sleeves with sufficient clearance for sealing as specified hereinafter. Size sleeves for branch piping from vertical risers large enough to permit vertical expansion at the riser.
- H. Place sleeves imbedded in concrete floors or walls in the forms before concrete is poured; sleeves shall have integral waterstop flanges, where they are to receive either watertight or hydrostatic seals.
- I. Install sleeves passing through above-grade floors of mechanical rooms, toilet rooms, kitchens or similar service areas where liquid leaks or spillover may occur in a watertight manner. Sleeves shall be such that waterproofing membrane can be flashed around and into the sleeve where necessary.
- J. Seal sleeves for pipes passing through ceiling air plenum walls or the floor above air tight in a manner similar to that specified for fire-rated sleeves.
- K. Hydrostatic Sealing Method: Provide compressible synthetic rubber seals, equivalent to LINK SEAL, manufactured by the Thunderline Corporation, or THRUWALL manufactured by O.Z. Gedney. Install seals in accordance with the manufacturer's recommendations to provide air tightness aboveground and hydrostatic sealing belowgrade. Caulking or other type mastic is not acceptable.
- L. Fire-Rated Sealing Method:
 - 1. Sleeves, openings and sealants shall comply with applicable codes, recommended practices and standards, and manufacturer's instructions. Fire sealants shall have ability to prevent spread of flame, smoke or water throughout the penetration and shall pass 3 hour test, UL test ASTM E814 and UL 1479.
 - 2. Products: Chase Corporation CTC PR-855, O. Z. Gedney CRS/CAFS, 3M Electro-Products Division Putty 303 or Caulk CP25 penetration sealing kits, General Electric Company sealants type RTV-850, 6428 or 7403, Thunderline Corporation "Link-Seal Pyro-Pak". Installation and type of sealant to be used as recommended by the manufacturer.
 - 3. Expansion collars, fire seal/firestop collars – ASTM E814 (UL1479). Spec Seal Corporation, Inc. (plastic pipe).

3.9 PLATES

- A. Furnish and install chrome plated plates wherever piping passes into finished area.
- B. Plates shall be securely fastened to piping or building construction.
- C. Floor plates shall cover 1 inch sleeve extension.

3.10 OFFSETS, TRANSITIONS, MODIFICATIONS

- A. Furnish and install all offsets necessary to install the work and to provide clearance for other trades.
- B. Maintain adequate headroom and clearance.
- C. Incidental modifications necessary to the installation of the systems shall be made as necessary and as approved by the Architect.

3.11 RECESSES

- A. Furnish information to the General Contractor as to sizes and locations of recesses required to install panels, boxes, and other equipment or devices which are to be recessed in walls.
- B. Make offsets or modifications as required to suit final locations.

3.12 LABELING

- A. All Plumbing equipment such as pumps, and devices requiring identification for operating procedures shall be provided with permanent black laminated micarta white core labels with 3/8 inch letters.
- B. This shall also apply to all controllers, remote start/stop pushbuttons and equipment cabinets.

3.13 FLASHING AND COUNTERFLASHING

- A. Roof drains, vents, roof curbs, etc., shall have counterflashing fittings. General Contractor shall provide flashing.
- B. Piping and conduit thru the roof shall be flashed by the General Contractor. Furnish and install counterflashing.

3.14 ACCESS

- A. Locate all equipment, valves, devices and controllers which may need service in accessible places.
- B. Where access is not available, access panels shall be provided. Furnish access doors to the General Contractor for installation.
- C. Access doors shall be Elmdor, Karp Co., MIFAB or Controlled Air Manufacturing Limited, with 16 gauge frames and 14 gauge steel door, prime painted.
- D. Maintain required access clearances.

3.15 WIRING

- A. Packaged plumbing system equipment shall be furnished with disconnect switches, and magnetic starters, factory furnished and wired by the unit manufacturer.
- B. All control wiring shall be furnished and installed under this Division of the work.
- C. All wiring shall be in accordance with the National Electrical Code and as recommended by the equipment manufacturer.

3.16 UTILITIES

- A. Do not interrupt any utility or service to the Owner without adequate previous notice and schedule.
- B. Arrange and pay for the relocation, disconnection or removal of, or relocate, disconnect or remove existing utilities and services where such work is shown or where such utilities or services interfere with new construction, whether or not shown. Provide all excavation, backfilling and paving required by such work.
- C. Perform alteration of utilities and services in accordance with the rules, regulations and requirements of the involved utility companies, regulatory agencies having jurisdiction.

3.17 CUTTING AND PATCHING EXTERIOR SURFACES

- A. This Contractor shall be responsible for returning disturbed paved and/or grass areas to original condition where excavation for utilities has been required.
- B. Cut and patch paved areas to match original surface.
- C. Properly tamp backfill before finishing or repairing disturbed area surfaces.

3.18 OPENINGS - CUTTING, REPAIRING

- A. This contractor shall cooperate with the work to be done under other sections in providing information as to openings required in walls, slabs and footings for all piping and equipment, including sleeves where required.
- B. Any drilling or cutting required for the performance of work under this Section, shall be the responsibility of this Contractor and the cost thereof shall be borne by him.
- C. Holes in Concrete: Sleeves shall be furnished, accurately located and installed in forms before pouring of concrete. This contractor shall pay all additional costs for cutting of holes as the result of the incorrect location of sleeves. All holes through existing concrete shall be either core drill or saw cut. All holes required shall have the approval of the Structural Engineer prior to cutting or drilling.
- D. It shall be the responsibility of this Contractor to ascertain that all chases and openings are properly located.

3.19 GUARANTEE

- A. All materials and equipment provided and/or installed under this section of the specifications shall be guaranteed for a period of one year from the date of acceptance of the work by the Owner unless otherwise specified in other applicable Divisions. Should any trouble develop during this period due to defective materials or faulty workmanship, the Contractor shall furnish all necessary labor and materials to correct the trouble without any cost to the Owner. Any defective materials or inferior workmanship noticed at time of installation and/or during the guarantee period shall be corrected immediately to the entire satisfaction of the Owner.

In the event of occupancy by the Owner prior to final acceptance of the project, the guarantee date for equipment placed in operation shall be mutually agreed to by the Contractor and the Owner's representative.

- B. Contractor to include an 11 month “walk-thru” of the building system with representatives of the School District, Architect, Engineer and the Construction Manager. The purpose is to establish a list of corrective work that relates to operational issues, material/installation deficiencies.

3.20 DRAWINGS

- A. The Plumbing and Fire Protection Systems are indicated on the Contract Drawings. Certain pertinent information and details required by the Plumbing and Fire Protection Work appear on the Architectural, Structural and Electrical Drawings; become familiar with all Drawings; and incorporate all pertinent requirements.
- B. Drawings are diagrammatic and indicate the general arrangement of systems and requirements of the Work. Do not scale Drawings. Exact locations of fixtures and equipment, not specifically shown shall be obtained before starting work.
- C. When indicated on the drawings, plumbing riser diagrams are completely diagrammatic and indicate the intent of the work for both the Contractor, L&I review agencies and/or Authorities Having Jurisdiction. Where valves, shock absorbers, incidental equipment, devices, etc., including execution notes are indicated on the riser diagrams, they shall be so required and installed as part of the system work.

3.21 RECORD DRAWINGS

- A. As-Built record drawings, showing dimensions, locations and depth of all buried and concealed piping, plugged outlets and equipment shall be kept up to date. Master copy shall be kept on the job. No backfilling of trenches shall be permitted until as-built drawings are approved as up-to-date by the Owner/Representative. No plumbing progress payments shall be approved unless as-built drawings are up- to-date. Depth of sewers shall be from a permanent bench mark as shown on the contract drawings. Refer to project record drawings under General Conditions.

END OF SECTION 22 00 00

SECTION 22 00 10

BASIC MATERIALS AND METHODS - PLUMBING

PART 1 – GENERAL

1.1 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.

1.2 REFERENCE

- A. Install all piping, fixtures, equipment, etc., to meet the requirements of the following:

City of Wilmington Department of License and Inspection
New Castle County Department of Sewers
City of Wilmington Plumbing Code
City of Wilmington Fire Marshal's Office
International Plumbing Code (All applicable sections)
International Mechanical Code (All applicable sections)
NFPA
OSHA

All requirements of the above governing agencies shall be in compliance with the latest issues, rules or regulations in effect.

- B. Appliances and materials governed by UL requirements shall meet such requirements and bear the label.

1.3 QUALITY ASSURANCE

- A. Provide adequate supervision of labor force to assure all aspects of specifications are being fulfilled.
- B. Insure that all work and equipment is installed in accordance with manufacturer's warranty requirements.
- C. Replace all pipes and fittings shown to be defective as a result of testing.

1.4 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 220000.
- B. Submit the following:
 - 1. Manufacturer's Product Data on all pipe and fittings to be used in project.
 - 2. Manufacturer's Product Data on all valves to be used in project.

1.5 WARRANTY/GUARANTEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

PART 2 – PRODUCTS

2.1 CAST IRON PIPE AND FITTINGS

(Note: Any cast iron piping made or marked “CHINA” will NOT be acceptable on this project)

- A. Aboveground:
1. Pipe & Fittings: Hubless cast iron, CISPI 301, ASTM A-74 and ASTM A-888 shall be marked with the collective trademark of the Cast Iron Institute (soil pipe).
 2. Joints: Neoprene sleeve and stainless steel shield and clamp assembly, CISPI 310, ASTM-1277.
- B. Below grade and/or slab: (Contractor's Option)
1. Bell and Spigot: Service weight bell and spigot pattern ASTM-74 with compression type neoprene gaskets ASTM C-564.
 2. Hubless: Hubless cast iron pipe CISPI 301, with heavy duty 3.04.016 stainless steel bands for below-grade installation. Elastomeric seal component ASTM C-564 and CSA B-602.
 3. Hubless Joints: Cast iron CISPI 310 and as TM C-1277.
 4. PVC DWV pipe and fittings, Schedule 40, ASTM D-2665, D2949, F891 and CSA B181.2.
 5. Corrosion protection shall be in accordance with IPC 305.1. Provide appropriate wrapping or sheathing when pipe is exposed to lime and acid of concrete, cinder or other corrosive materials.
 6. Protection of all below-grade storm and sanitary shall be in accordance with IPC Section 305.
- C. Corrosion protection shall be in accordance with IPC 305.1. Provide appropriate wrapping or sheathing when piping is exposed to lime and acid of concrete, cinder or other corrosive materials.

2.2 COPPER TUBING

- A. Domestic hot, cold and recirculated water:
1. Aboveground:
 - a. Tubing: Hard-drawn, seamless ASTM B-88, Type "L".
 - b. Fittings: Solder joint wrought copper ANSI B-16.22.

- c. Joints: Lead-free solder 410°, ASTM B-32 alloy designation "TC", ASTM B-828.
- d. Flux: Non-toxic and non-corrosive, ASTM B-813.

2. Underground:

- a. Tubing: Soft-drawn, seamless ASTM B-88, Type "K".
- b. Fittings: Solder joint wrought copper ANSI B-16.22.
- c. Joints: Lead-free solder 410°, ASTM B-32, ASTM B-828.
- d. Flux: Non-toxic and non-corrosive, ASTM B-813.

B. Drainage and vent piping:

1. Aboveground:

- a. Tubing: Hard-drawn seamless ASTM B-88, ASTM B-75, Type "M" and DWV as pipe size permits.
- b. Fittings: Solder joint cast copper drainage type ANSI B-16.29.
- c. Joints: Soldered, 95/5 tin-antimony ASTM B-828, ASTM B-32.
- d. Flux: Non-toxic and non-corrosive, ASTM B-813.

C. Solder/Flux: See Paragraph 3.4 of this section for Soldering/Brazing.

2.3 PVC GRAVITY SEWER PIPE (BELOW GROUND ONLY)

- A. Pipe: Unplasticized polyvinyl chloride (PVC) with integral wall bell and spigot joints.
- B. Material: ASTM D-3034 for SDR 35, colored green for inground identification as sewer pipe.
- C. Joints: Two sections of pipe shall be assembled in accordance with manufacturer's recommendations and tested as per ASTM D 3212 for use with flexible elastomeric seals.
- D. Sizes: For site drainage systems 4" to 15".
- E. Additional compliances:
 - 1. Drop Impact Test - ASTM D-2444
 - 2. Pipe Stiffness - ASTM D-2412
 - 3. Temperature for Testing - Designed to pass all tests at 73 degrees F (+/- 3 degrees F).

2.4 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

- A. Underground – Drainage & Vent (Sanitary) IPC Table 702.2
 - 1. ASTM D 2665
 - 2. ASTM D 2949
 - 3. ASTM F 891
 - 4. CSA CAN/CSA-B 181.2

- B. Building Sewer Pipe (Near Water Service) IPC Table 702.3 (DWV)
 - 1. ASTM D 2665
 - 2. ASTM D 2949
 - 3. ASTM D 3034
 - 4. ASTM F 891
 - 5. CSA B182.2
 - 6. CSA B 182.4 (Ribbed Sewer Pipe & Fittings)

- C. Fittings:
 - 1. ASTM D 3311
 - 2. ASTM D-2665
 - 3. ASTM F-1866

- D. Solvent Cement: (All Purpose on ABS, PVC and CPVC)
Potable Water, Sewer, Drain Waste and Vent
 - 1. ASTM D-2564, D-2235 and F-493
 - 2. CSA B137.3
 - 3. CSA B181.2 or B182.1 (Sanitary Pipe only)
 - 4. ASTM D2855
 - 5. CSA B181.1

- E. Primers: (PVC and CPVC)
 - 1. ASTM F 656, purple color, SCAQMD Rule 1168 and OTC Regulations for VOC emission levels. NSF Standard 61 PW, DWV, Sewer.

- F. Uniformity: To insure installation uniformity, all piping components shall be of one manufacturer.

2.5 VALVES (Copper Systems) – Solder ends of Threaded

- A. Valves listed below shall be for domestic water systems and comply with the latest requirements of NSF 61-8. Refer to individual sections for gas valves.

- B. Ball Valves: NIBCO two piece, full port, 600 psi WOG rated, cold non-shock valve with reinforced TFE seals, 316 stainless steel ball, Eco-brass body, ASTM 584, Alloy C87850, solder ends, or threaded non-blowout stem design. Acceptable NIBCO figure numbers: T/S 685-80-66-LF; T/S 595-Y-66-LF (3 piece).

- C. Check Valves: NIBCO Class 125, Eco-brass body, ASTM 584, Alloy C87850, swing type, Y Pattern, threaded cap access. Acceptable NIBCO figure number: T/S 413-LF.

- D. Gate Valves: NIBCO Class 125, Eco-Brass body, ASTM 584, Alloy C87850, Rising Stem. Acceptable NIBCO figure number: T/S 113-LF.

- E. Balance Valves: All balance valves shall be provided with a memory stop feature with calibrated name plate to assure specific valve setting. Bronze body/brass ball, carbon filled TFE seat rings. NIBCO, Bell & Gosset, Accu-Flow, Taco or Flow Design "Accusetter". Acceptable NIBCO figure numbers: T/S 1710, F/G 737.
- F. Strainers:
1. Class 125 Bronze Y-Strainer, body to be ASTM B584 or B62 bronze with threaded, solder or female press end connections and .033 inch perforated type 304 stainless steel screen or 20 mesh type 304 stainless steel screen accessible without removing the strainer from the line. Acceptable Figure numbers: NIBCO Fig. S/T-221, S/T-222, PF-221/222-A,B.
 2. Class 125 Flanged Cast Iron Y-Strainer, body to be ASTM A-126 Class B cast iron. End connections to be Class 125 flanged, tapped bolted bonnet with plug. Screen shall be .033 inch perforated type 304 stainless steel screen or 20 mesh type 304 stainless steel screen accessible without removing the strainer from the line. Acceptable Figure numbers: NIBCO Fig. F 721-A.
 3. Class 250 Threaded Cast Iron Y-Strainer: Strainer body to be ASTM A-126 Class B cast iron. End connections to be Class 250 threaded, tapped screw-in bonnet with plug. Screen shall be .033 inch perforated type 304 stainless steel screen or 20 mesh type 304 stainless steel screen accessible without removing the strainer from the line. Acceptable Figure numbers: NIBCO Fig. T-751-A
- G. VALVES (Copper Systems) – Press Fit
1. Valves listed below shall be for domestic water systems and comply with the latest requirements of NSF-61-8.
 - a. 2 Inch and Smaller Ball Valves (On/Off):

Ball Valves with male or female press to connect shall be rated at 200 PSI CWP to +225°F maximum. Valves shall be manufactured in accordance with MSS SP-110 and constructed of dezincification resistant cast bronze bodies. Brass with more than 15% zinc shall not be approved. Valve shall have reinforced PTFE Seats, Blow-out Proof Stem, Full Port Ball, Chrome/Nickel Plated or Stainless Steel Ball for aggressive water.
 - b. 2 Inch and Smaller Check Valves (Swing Type):

Check valves shall be swing type Y pattern with male or female press to connect ends and shall be rated 200 PSI CWP to + 250°F maximum. Valves shall be manufactured in accordance with MSS SP-80. Body & cap shall be manufactured of dezincification resistant cast bronze ASTM B62 or ASTM B584 Alloy C8440. Valves shall have PTFE seat disc.

c. 2 Inch and Smaller Check Valves (Lift or Spring Type):

Incline resilient disc, spring actuated, 250psi rating, non-shock cold working pressure, 2500F maximum working temperature, bronze ASTM B584 alloy C84400. Stainless steel stem and disc holder and spring, EDPM O-ring.

- H. Insofar as possible, all valves of the same type shall be of the same manufacturer.
- I. Valve Manufacturers: Subject to compliance with requirements, provide valves of one of the following:

Apollo/Conbraco
Stockham
Nibco
Milwaukee
Watts
Hammond
Webstone

J. System Application:

1. Domestic Water:

- a. Check Valves - 2" & Smaller - threaded or soldered.
- b. Ball Valves - 3" & Smaller - threaded or soldered.
- c. Balance Valves - All sizes - threaded.
- d. Butterfly Valves - 4" and larger - flanged.
- e. Butterfly Valves – 3" and smaller – wafer type.

2.6 THERMOMETERS

- A. Separable socket, inserted into fluid flow, adjustable, hermetically sealed, red mercury, die-cast, baked enamel finish, double strength glass lens, white scale and black graduations.
- B. Scale: Select range of thermometer to indicate normal operating temperature at mid-point of scale for domestic water systems.
- C. Manufacturer: U.S. Gauge, H.O. Trerice, Moeller, Duro.

2.7 GAUGES

- A. Phosphor bronze bourdon tube, polypropylene case, gasketed glass crystal, aluminum dial, black graduations 4-1/2 inch diameter.
- B. Range: 0 to 150 psi, 5 pound intervals, 1/2 pound graduations.
- C. Manufacturers: Danton, U.S. Gauge, H.O. Trerice, Moeller.
- D. Install with bronze gauge cock.

2.8 ISOLATING FITTINGS

- A. Furnish isolating fittings between all sections of dissimilar piping materials or piping, general supports, equipment and supports, including piping hanger and rack supports where one material is ferrous and the other is non-ferrous.
- B. Install copper or brass piping or tubing in such a way as not to touch or come in contact with ferrous metals.
- C. Where ferrous piping or equipment is connected to copper or brass piping, make connection with insulating or dielectric unions to prevent electrolytic action between the ferrous and non-ferrous metals.
- D. Where copper or brass piping, tubing or fittings are anchored to, supported by or may come in contact with ferrous metal construction, provide an insulating nonconductor spacer of rubber, fiber or equivalent material to assure prevention of electrolysis.
- E. Manufacturer: Epco Sales, Inc., or insulated unions by Central Plastic Co.

2.9 ANCHORS AND GUIDES

- A. Anchors and guides shall be provided to support and maintain pipes in position and properly distribute expansion. The anchors and guides must be securely fastened to the building structure, and must be completely installed before the system is tested.
- B. Guides shall be as manufactured by J.J. McNally, Inc., Flexonics, Inc., Tube-Turns, American District Steam Co.

2.10 UNIONS

- A. Up to and including 2 inch pipe size: Screwed pattern, bronze-to- bronze seat.
- B. Above 2 inch pipe size: 125 Class Flanged pattern, A.S.A. sweat copper fitting, with gaskets, bolts and nuts.
- C. Copper tubing unions shall have sweated type ends. Flanged unions on copper tubing may be soldered connections.
- D. Materials and pressure ratings shall be the same as specified for the respective pipe and fitting system unless otherwise specified.

PART 3 – EXECUTION

3.1 PIPING SYSTEM INSTALLATION REQUIREMENTS

- A. Drawings are generally diagrammatic and due to small scale, it is impossible to indicate all fittings, valves, gauges and specialties required. Provide complete operating systems and all necessary fittings, valves gauges and specialties whether or not indicated.

- B. Install all piping in accordance with the best practices of the trade and latest code requirements. Use uniform system materials throughout the building. All branch take-offs shall be off the top of the pipe.
- C. Pipe and fittings shall be clean from cutting burrs, foreign materials and defects in structure and threading. Make all cuts square. Ream after cutting. Clean off scale and dirt inside and outside, before assembly. Remove welding slag or other foreign material.
- D. Keep all piping as high as possible, consistent with proper pitch, to maintain maximum headroom. Cut piping accurately to measurements established at the building, work into place without springing, forcing or cutting of the building structure, and install as directly as possible between connecting points parallel with or at right angles to building construction, except as required to obtain pitch.
- E. Unless otherwise shown, run piping within the building, concealed in the walls, furred spaces, pipe spaces or above suspended ceilings. Unless otherwise noted, do not build in or bury horizontal piping in partitions. Install all exposed piping as closely as possible to walls, ceilings and columns, consistent with access and applicable insulation requirements.
- F. This project includes a return air plenum ceiling. Regardless of materials specified, all system piping and/or materials shall be non-combustible and shall be in full compliance with the requirements set forth in the IPC.
- G. All piping to drain to low points. Low points will be provided with drain valves with hose thread. All piping shall have high points vented with ball valve, nipple and threaded cap.
- H. Do not install trapped lines where water cannot be drained or air can accumulate without being vented.
- I. Piping shall run square with building lines.
- J. Piping shall not be insulated or covered until tested and until building is closed in.
- K. Necessary drains, off-sets, vents and drips shall be provided for coordination of the work as part of the contract.
- L. Piping shall not be installed over electrical transformers, panels, switchgear, substations, and control panels as per the National Electric Code. No piping shall be installed in elevator machine rooms unless it is directly related to the room's system equipment.
- M. Allow clearance for expansion and contraction.
- N. Install isolating fittings between sections of ferrous and non-ferrous pipe or connected equipment.
- O. Valves shall be installed with stems above horizontal.
- P. Valves shall be installed on all sides of equipment and control valves to allow isolation for repair.

- Q. Do not support piping from other piping, conduits or equipment. Provide additional bracing to prevent movement of trapeze piping, or any singular run of pipe to fixtures. Provide additional bracing on all piping through walls to flush valves to prevent movement during normal operation or performing maintenance on valves.
- R. Thermometers and gauges shall be installed where indicated on the drawings, required by equipment specifications and where indicated elsewhere in the specifications. Gauges shall be located at an elevation that can be readable.
- S. Unions shall be provided adjacent to all valves, at equipment connections, and where necessary to facilitate dismantling of the piping system.
- T. Ball valves to be installed with the proper clearance for operating the valve handle. A minimum clearance of 10" from center of valve to wall must be maintained for ease of operation.
- U. Thermometers are to be located so they can easily be seen from the floor in front of unit. Make final adjustment by tilting thermometer. Locate bulb in waterway with an oversized tee or elbow fitting.
- V. Install pressure gauges on incoming services both domestic water and fire services. Locate pressure gauge after main shut-off valve and ahead of water meter if one is provided within building.
- W. All pipe unions installed shall be accessible. Unions shall not be concealed or located in places where they cannot be maintained.
- X. Support and bracing of 4" and above pipe shall be in accordance with the CISPI Standards and IPC Chapter 3.

3.2 TAGS, CHARTS, AND IDENTIFICATION

- A. All piping shall be labeled in accordance with IPC 303.1 and 303.4.
- B. Identify each valve in all systems with black, numbered and stamped 1-1/2" brass or aluminum tags fastened to valve by brass chain and S-hook.
- C. Piping Identification: Provide identification and safety products, semi-rigid plastic, wraparound pipe markers with flow arrows and conforming to ANSI A13.1. Locate marker at each valve, changes in direction, where pipes pass thru barriers and every 25' of horizontal runs. Lettering on background shall be in accordance with the following colors:

Legend	Background	Lettering
1. Gas	- Yellow	- Black
2. Fire Protection	- Red	- White
3. Domestic Cold Water	- Green	- White
4. Domestic Hot Water (110° ^ 140°)	- Yellow	- Black
5. Domestic Hot Water Return (110° ^ 140°)	- Yellow	- Black
6. Sanitary Drainage	- Green	- White

7. Condensate Drainage	- Yellow	- Black
8. Vent	- Yellow	- Black
9. Storm Drainage	- Green	- White

- D. Provide 1/8" scale diagrams showing location, number and service or function of each tagged item.
 - 1. Frame diagrams in approved metal frames with clear acrylic front, hinges, and locks.
 - 2. Secure to wall in Mechanical Room.
 - 3. Provide two additional separate copies permanently covered and bound.

- E. Furnish and install color coded 1" diameter markers on ceiling tile grids to indicate system and valve locations.
 - 1. Domestic cold water: - Green
 - 2. Domestic hot water: - Yellow
 - 3. Domestic hot water return: - Yellow
 - 4. Gas - Yellow

- F. Available Manufacturers: Subject to compliance with requirements, manufacturer's offering identification markers which may be incorporated in the work are limited to the following:

Seton
 Brimar
 B-Line
 Marking Services, Inc.

3.3 SOLDERING/BRAZING

- A. Connections between copper tubing and copper sweat fittings shall be made by soldering using Taramet Sterling or approved substitute. Flux shall be non-corrosive type "Nokorode" or approved substitute or as recommended by the manufacturer of the solder.

- B. All solder shall be "lead nickel and antimony free" in accordance with the Federal Safe Drinking Water Act Amendments of 1986 and 1996 as is ASTM B-32 Grade TC.

Composition:

Tin 95%
 Copper 4.0 – 5.0%
 Selenium .04 - .2%
 Tensile Strength 7,130 psi
 Shear Strength 5,970 psi
 Melting temperature 410°F

- C. Tubing shall be cut square and then reamed and deburred. End of tubing and inside of fitting cup shall be cleaned with steel wool and the flux shall be applied to the clean surface before soldering. After soldering, the excess solder shall be wiped off while still plastic.

- D. 410 solder shall be used for all joints in:
 - 1. Domestic cold water
 - 2. Domestic hot water
 - 3. Domestic hot water return
 - 4. Copper drainage piping
- E. Lead-Tin (50-50) solder or any solder containing lead shall NOT be used or permitted for joint connections on this project.
- F. Form continuous solder bead or brazing filler bead around entire circumference of joint.
- G. Wipe excess solder from joint area while solder is still plastic.
- H. Solder joints shall be in accordance with IPC Section 605.2, 605.14.3 and ASTM B838. Flux shall conform to ASTM B-813.

3.4 PRESS-FIT SYSTEM

- A. All new domestic water piping installed on this project shall be a solderless, press-fit, domestic water system. The system shall be Viega/Rigid copper press fitting system. Fittings shall be rated 0 to 250 at 200 psi and tested to 600 psi.
- B. Fittings shall meet ANSI/NSF 61, – ASME B-16.22 and ASTM B88. Elastomeric seals shall meet ASTM D-2000.
- C. Mechanical joining shall be recognized by:
 - IPC International Plumbing Code
 - SBCCI Standard Plumbing Code
 - IAPMO Uniform Plumbing Code
 - PHCC National Standard Plumbing Code
- D. Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press end shall have SC (Smart Connect) feature design (leakage path). Smart Connect™ (SC Feature). In ProPress ½” to 4” dimensions, the Smart Connect Feature assures leakage of liquids and/or gases from inside the system past the sealing element of an unpressed connection. This feature shall provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.
- E. Press Connections: Copper press fitting joints shall be made in accordance with the manufacturer’s installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

- F. Installer shall be a qualified installer, licensed within the jurisdiction, and familiar with the installation of ProPress copper press joint systems. ProPress copper press fittings shall be installed using the proper tool, actuator, jaws and rings as instructed by the press fitting manufacturer. The installation of copper tubing for hot and cold water distribution systems shall conform to the requirements of the ICC International Plumbing Code or IAPMO Uniform Plumbing Code.
- G. Note: Viega Press-fit installation shall only be permitted on this project. Push-on shark-teeth, or any type connection fittings that are not Press-Fit, shall NOT be approved.
- H. T-drill mechanically formed tee fittings shall be used in conjunction with the ProPress Copper System in accordance with the IPC Chapter 6 Section 605.5.1, 605.5.1.2 and 605.14.1. Use caution around combustible material and follow all safety guidelines for open flame during silver brazing.

END OF SECTION 22 00 10

SECTION 22 00 30

INSULATION & COVERING – PLUMBING

PART 1 – GENERAL

1.1 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.

1.2 DESCRIPTION OF WORK

- A. This section includes insulation and covering furnished and installed on the following piping systems and equipment:
 - 1. Domestic cold water.
 - 2. Domestic hot water supply and return
 - 3. “Primary” Horizontal rainwater conductors including underside of roof drains. “Secondary” rainwater systems insulation is not required.
 - 4. Condensate waste piping from air conditioning units.
 - 5. Exposed waste, trap and wall supplies at all handicap lavatories.
 - 6. Branch waste lines from all chilled water fountains.

1.3 REFERENCE STANDARDS

- A. Refer to Section 220000 for a general description of requirements applying to this section.
- B. Materials shall conform to the requirements of the NFPA Code.

1.4 QUALITY ASSURANCE

- A. Refer to Section 220010 for a general description of requirements applying to this section.

1.5 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 220000.
- B. Submit the following:
 - 1. Product data on all insulation and covering.

1.6 WARRANTY/GUARANTEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

PART 2 – PRODUCTS

2.1 PIPE INSULATION MATERIAL

A. Closed Cell:

1. Material: Flexible elastomeric foamed plastic closed cell structure insulation 25/50 rated with a flame spread rating of 25 or less and a smoke developed rating of 50 or less.
2. Flexible pipe insulation shall be a foamed plastic closed cell structure material, with a thermal conductivity of not more than 0.27 Btu/Hr./Sq. Ft./Inch at a mean temperature of 75 degrees F. The insulation shall have an average density of at least 2 pounds per cubic foot, shall be self-extinguishing, and shall have a water vapor transmission rating of not more than 0.1 perms. Between temperature limits of -40 degrees F and plus 220 degrees F, the insulation shall not indicate any deviation from its original state.
3. Manufacturers: Armacel, Insul-Tube, Nomaco Insulation.
4. Specification Compliance: (Latest accepted Standards and Codes)

IECC 804.5:	Insulation thickness for domestic hot and recirculation mains.
ASTM-E-84	Flame spread and smoke developed.
NFPA 255:	Standard method of test of surface burning of building materials.
ASTM C177:	Thermal conductivity.
NFPA 90A, 90B:	Flame & smoke rating
ASTM-C-534 Type 1	Tubular Grade, Self-Sealing
UL 181	Factory made air ducts and air connectors. (Armacell UL181 has to do with mold growth)
UL723	Test for surface burning characteristics of building materials.
ASTM G21/C1338:	Fungi resistance
ASTM G2:	Bacterial Resistance
ASTM D1056, 2B1:	Standard spec for flexible cellular materials.
MIL-P-15280J, FORMT	
MIL-C-3133B (MIL STD 670B)	Grade SBE-3
MEA 96-85M	

B. Covering of Pipe Insulation Outdoors:

1. Wrapping: Wrap insulation with embossed .016" aluminum jacket.
2. Fastenings: Cover shall be held in place with soft aluminum bands on 12" centers.
3. Valves and Fittings: Weatherproof all valves and fittings.
4. Manufacturers: Johns-Manville, Certain-Teed, Owens-Corning, Knauf.

C. Protective cover for foam insulation in wet areas indoors:

1. PVC heavy duty fitting covers and jacketing for kitchen wet areas.
2. Fitting covers shall be glossy white, high impact, UV resistant PVC.
3. Operating Temperature Limit: Up to 150°F.
4. Flame Spread: 25 or less.
5. Smoke Developed: 50 or less.
6. Grade: Weatherable.
7. Color: White
8. Finish: Gloss
9. Fitting covers and jacketing shall be "Zeston" 300 Series PVC, heavy duty covers and "Zeston" PVC jacketing.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Do not install until systems have been tested and meet requirements.
- B. Heavy work which may damage insulation shall have been completed in the vicinity of the insulation work.
- C. All installations shall be made by skilled craftsmen regularly engaged in this type of work.
- D. Insulation shall be continuous thru-wall, ceiling and floors.
- E. Pipe and equipment to be clean and dry prior to insulating.
- F. Install all insulation in strict conformance with manufacturer's instructions.
- G. Where "Barrier-free" lavatory supplies and waste are covered with a protective covering or insulation, the insulation must be installed back to wall, flush with wall escutcheon. Escutcheon to be finished flush with wall and wall opening to be smaller than escutcheon plate through entire building.
- H. Install pipe insulation by slitting tubular sections and applying onto piping or tubing. Alternately, whenever possible, slide unslit sections over the open ends of piping or tubing. All seams and butt joints shall be adhered and sealed using Armaflex 520 or 520 BLV Adhesive. If when using AP Armaflex SS, only the butt joints shall be adhered using Armaflex 520 or 520 BLV Adhesive, Armaflex HT 625 Adhesive shall be used with HT Armaflex.
- I. Insulation shall be pushed onto the pipe, never pulled. Stretching of insulation may result in open seams and joints.
- J. Tape the ends of the copper tubing before slipping the Armaflex insulation over the new pipes to prevent dust from entering the pipe.
- K. All edges shall be clean cut. Rough or jagged edges of the insulation shall not be permitted. Proper tools such as sharp, non-serrated knives must be used.

- L. On cold piping, insulation shall be adhered directly to the piping at the high end of the run using a two-inch strip of Armaflex 520 or 520 BLV Adhesive on the ID of the insulation and on the pipe. All exposed end cuts of the insulation shall be coated with Armaflex 520 or 520 BLV Adhesive. All penetrations through the insulation and termination points must be adhered to the substrate to prevent condensation migration.
- M. Sheet insulation shall be used on all pipes larger than 6" IPS. Insulation shall not be stretched around the pipe. On pipes larger than 12" IPS, adhere insulation directly to the pipe on the lower 1/3 of the pipe.
- N. Seams shall be staggered when applying multiple layers of insulation.

3.2 VALVES, FLANGES AND FITTINGS:

- A. All fittings shall be insulated with the same insulation thickness as the adjacent piping. All seams and mitered joints shall be adhered with Armaflex 520 or 520 BLV Adhesive. Screwed fittings shall be sleeved and adhered with a minimum 1" overlap onto the adjacent insulation. Armaflex HT 625 Adhesive shall be used with HT Armaflex.
- B. Valves, flanges, strainers and Victaulic couplings shall be insulated using Armaflex donuts that shall then be covered with sheet or oversized tubular insulation.

3.3 HANGERS

- A. Support piping system using high density inserts with sufficient compressive strength. The pipe support insulation shall be elastomeric foam with the same or greater thickness than the pipe insulation. All joints shall be sealed with Armaflex 520 or 520 BLV adhesive.
- B. Standard and split hangers: Piping supported by ring hangers shall have hangers insulated with the same insulation thickness as the adjacent pipe. All seams and butt joints shall be sealed with Armaflex 520 or 520 BLV Adhesive. Armaflex HT 625 Adhesive shall be used with HT Armaflex. Ring hangers may be sleeved using oversized tubular insulation. On cold piping, insulation shall extend up the hanger rod a distance equal to four times the insulation thickness. Insulation tape may be used to a thickness equal to the adjacent insulation thickness.
- C. Clevis Hangers or other pipe support systems: Saddles shall be installed under all insulated lines at unistrut clamps, clevis hangers or locations where the insulation may be compressed due to the weight of the pipe. All piping shall have wooden dowels or blocks of a thickness equal to the insulation inserted and adhered to the insulation between the pipe and the saddle.

It is highly recommended for continuous insulation protection to use hanger sizes equal to the outer diameter of the pipe plus insulation thickness

- D. Armafix IPH or Armafix NPH can be used to prevent compression of insulation at standard split, clevis hangers or other pipe support systems. To minimize the movement of Armafix, it is recommended that a pair of non-skid pads be adhered to the clamps. In addition, to prevent loosening of the clamps, use of an antivibratory fastener, such as a nylon-locking nut, is also recommended.

3.4 PIPE COVERING (FOAMED PLASTIC TYPE)

- A. All joints and seams shall be sealed with a compatible adhesive. Approved adhesives are as follows:

Armaccel No. 520 (Low VOC use 520 BLV)
Benjamin Foster Company No. 85-75 up to 200 degrees F.

Contractor may use self-sealing insulation in lieu of above.

- B. Fitting covers shall be fabricated from the foamed plastic pipe insulation or from sheet insulation of the identical material. The fabrication shall be in accordance with manufacturer's instructions, and all seams mitered joints shall be joined using the adhesives described.

3.5 PIPE INSULATION – TYPES & THICKNESSES

- A. Flexible Closed Cell:

Piping System	Up to 3"	Over 3" to 6"	Over 6"
Cold Water	1/2"	1/2"	3/4"
Hot Water (120°)	1"	1"	1-1/2"
Hot Water Return (120°)	1"	1"	1-1/2"
Hot Water (140°)	1"	1"	1-1/2"
Hot Water Return (140°)	1"	1"	1-1/2"
Condensate Waste	1/2"	1/2"	-
Horizontal Storm (Primary)	1/2"	1/2"	3/4"
Horizontal Storm (Secondary)	-----Not Required-----		
Underside of Roof Drains	1/2"	1/2"	3/4"
Branch Waste From EWC's	1/2"	---	---
Handicap Lav Waste & Water	1/2"	---	---
Soil/Waste Piping Above Ceiling	1/2"	1/2"	3/4"

END OF SECTION 22 00 30

SECTION 22 01 10

DRAINAGE SYSTEMS – PLUMBING

PART 1 – GENERAL

1.1 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.

1.2 DESCRIPTION OF WORK

- A. This section includes:
1. Soil and waste piping system work as indicated on drawings and schedules, and by requirements of this section.
 2. Applications for soil and waste piping systems include the following:
 - a. Above ground soil, waste and vent piping within buildings including soil stacks, vent stacks, horizontal branches, traps and connections to fixtures and drains.
 - b. Underground building drain piping including mains, branches, traps, connections to fixtures and drains, and connections to stacks, extension from the building, terminating at connection to site sewer.
 3. Storm water drainage piping as indicated on drawings and by requirements of this section.
 4. Applications for storm water drainage piping include the following:
 - a. Roof drains and connections to gutters, with rain water conductors and connections to underground building storm drains.
 - b. Underground building storm drains, extending and connecting to site drainage system.
 5. Insulation for soil and waste and storm water drainage as specified in Section 220030 is included as work of this section.
 6. Trenching and backfilling required in conjunction with underground building drainage and site drainage piping as specified in Section 220000 is included as work of this section. Refer to Division I.
 7. Installation of detectable metallic underground tape for all exterior buried PVC drainage piping.

1.3 REFERENCE STANDARDS

- A. Refer to Section 220000 for a general description of requirements applying to this section.

1.4 QUALITY ASSURANCE

- A. Refer to Section 220010 for a general description of requirements applying to this section, and a listing of all applicable codes.

1.5 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 220000.
- B. Submit the following:
 - 1. Product data on all systems equipment.
- C. See requirements for submission of cross referencing information.

1.6 WARRANTY/GUARANTEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

PART 2 – PRODUCTS

2.1 PIPING UNDERGROUND

- A. Interior:
 - 1. Sanitary, storm water and condensate waste drainage piping within the building and extending beyond the building wall, unless otherwise noted on the plans shall be an option selection of a, b, or c below:
 - a. Service weight hub and spigot pattern cast iron soil pipe and fittings with neoprene gaskets.
 - b. Hubless cast iron soil pipe and fittings with cast iron coupling clamps and gaskets or heavy duty 3.04-.016" thick stainless steel bands..
 - c. PVC Schedule 40 pipe and fittings with solvent cement joints.

2.2 PIPING ABOVE GROUND (PLENUM RATED CEILING)

- A. All above ground storm water, condensate, soil, waste and vent piping shall be:
 - 1. Hubless cast iron soil pipe with cast iron drainage fittings, couplings and stainless steel clamp bands for piping 2" and larger.

2. Copper tubing, type DWV with wrought copper solder type drainage fitting for piping smaller than 2" in size.

2.3 CONDENSATE WASTE PIPING SYSTEM

- A. All aboveground condensate waste piping including connection to equipment shall be:
 1. PVC pipe and fittings type DWV with solvent cement joint connections.
 2. Copper tubing, type DWV with wrought copper solder type drainage fittings.

2.4 FLASHING

- A. All vents extending through the roof shall be flashed by the General Contractor. However, the Plumbing Contractor shall furnish and install the necessary counterflashing consisting of a Jay R. Smith Figure 1750 counterflashing fitting, or approved substitute as manufactured by Josam or Zurn. Vents shall terminate 18" above the roof.

2.5 SYSTEMS EQUIPMENT

- A. Refer to Plumbing Fixture and Equipment Schedule for type, number, size and manufacturer of all drainage equipment and accessories.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering drainage equipment which may be incorporated in the work are limited to the following:

Cleanouts

Zurn
Josam
Wade
Watts
Smith
MIFAB

- C. Cross Reference Identification:
 1. If the Contractor selects a manufacturer of drainage equipment products other than as identified on the Schedule but is selected from the available manufacturers listed above, a cover sheet shall be included with the submission of shop drawings indicating the cross referenced manufacturer and model number.
 2. Shop drawings shall not be reviewed or accepted if not in compliance with this requirement.

PART 3 – EXECUTION

3.1 INSTALLATION OF SOIL AND WASTE PIPING

- A. The Plumbing Contractor shall install a complete system of sanitary drainage piping as shown on the drawings. All drainage lines shall be properly run, trapped and vented in accordance with the

local Plumbing Code and all dry vents, back vents, loop vents, revents or special vents required by the Code shall be furnished and installed by the Plumbing Contractor.

- B. Drainage lines of the sizes shown on the drawings shall be extended within the building with branches connecting to the base of all soil, waste and vent stack, etc., leaving outlets for connection to all fixtures, floor drains, as required.
- C. All changes in direction of drainage piping shall be installed with "Y" branches and 1/8 bends. All stacks shall be supported with concealed pipe clamps or hangers as required and the openings in the roof for the vent pipes will be provided by this Contractor.
- D. All drainage piping which will be located above suspended ceilings shall be checked for slope to assure positive drainage, prior to installation of the ceilings. Pressure tests for leaks, as hereinafter specified, shall also be performed prior to ceiling installation.
- E. Install soil and vent piping pitched to drain at minimum slope of 1/4" per foot (2%) for piping 3" and smaller, and 1/8" per foot (1%) for piping 4" and larger.
- F. Vertical to horizontal change in direction to be made with long radius fittings.
- G. Support all soil and waste piping per IPC Section 308.5, 308.6 and 308.7.

3.2 INSTALLATION OF STORM WATER DRAINAGE PIPING

- A. All changes in direction of drainage piping shall be installed with "Y" branches and 1/8 bends. All stacks shall be supported with concealed pipe clamps or hangers as required, and the openings in the roof for the vent pipes will be provided by this Contractor.
- B. All drainage piping which will be located above suspended ceilings shall be checked for slope to assure positive drainage, prior to installation of the ceilings. Pressure tests for leaks, as hereinafter specified, shall also be performed prior to ceiling installation.
- C. Install storm water drainage piping pitched to drain at minimum slope of 1/8" per foot (1%) for piping 4" and larger.
- D. Vertical to horizontal change in direction to be made with long radius fittings.

3.3 INSTALLATION OF CLEANOUTS

- A. Cleanouts: Install in sanitary piping and storm conductor and building drain piping as indicated, and/or as required by International Plumbing Code; at each change in direction of piping greater than 45 degrees; at minimum intervals of 100' for all size straight run piping; and at base of each conductor. Install floor and wall cleanout covers for concealed piping, select type to match adjacent building finish.

3.4 INVERTS AND ELEVATIONS

- A. Indicated inverts and elevations of existing utilities are approximate and based on the best information available. Upon award of Contract, Contractor shall verify in the field all such information and report any discrepancies to the Engineer before proceeding with work.

3.5 PIPING INSTALLED IN FILLED GROUND

- A. Piping located below floor slab in filled areas shall be supported either from the floor slab, or with masonry piers to undisturbed earth. Drainage piping shall be supported at each joint. Exterior piping located in filled areas shall be supported with piers.
- B. Details of supports and method of installation shall meet with the approval of the Engineer.

3.6 INSPECTION

- A. The Plumbing Contractor shall, upon completion of the drainage systems, secure from the Inspector and/or the Municipality under which the installation was made and inspected, certificates or letters of approval indicating the system has been installed satisfactorily. The Plumbing Contractor shall certify that all inspection fees, permits and charges have been duly paid.

END OF SECTION 22 01 10

SECTION 22 01 20

DOMESTIC WATER SYSTEMS – PLUMBING

PART 1 – GENERAL

1.1 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.

1.2 DESCRIPTION OF WORK

- A. This Section includes:
 - 1. Domestic water piping systems work is indicated on drawings and schedules and by requirements of this section.
- B. Applications for water piping systems include the following:
 - 1. Domestic cold-water piping.
 - 2. Domestic hot-water piping.
 - 3. Domestic recirculating-water piping.
- C. Insulation for domestic water piping as specified in Section 220030 is included as work of this section.
- D. Trenching and backfill required in conjunction with exterior water piping as specified in Section 220000 is included as work of this section. Refer to Division 1.

1.3 REFERENCE STANDARDS

- A. Refer to Section 220000 for a general description of requirements applying to this section.

1.4 QUALITY ASSURANCE

- A. Refer to Section 220010 for a general description of requirements applying to this section.

1.5 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 220000.
- B. Submit the following:
 - 1. Product data on all specialties and systems equipment.

1.6 WARRANTY/GUARANTEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

PART 2 – PRODUCTS

2.1 DOMESTIC WATER PIPING MATERIALS AND PRODUCTS

- A. Provide piping materials and factory fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in domestic water piping systems. Where more than 1 type of materials or products are indicated, selection is Installer's option.

2.2 BASIC PIPE, TUBE AND FITTINGS

- A. Provide pipe, tube, and fittings complying with Division 22 Basic Materials and Methods section "Pipe, Tube, and Fittings", in accordance with the following listing:

- B. Interior Domestic Water Piping:

Tube Size 4" and Smaller:	Copper tube.
Wall Thickness:	Type "L" hard-drawn temper.
Fittings:	Wrought-copper, solder-joints.

- C. Exterior Water Service Piping:

Pipe Size 3" and Smaller:	Copper tube.
Wall Thickness:	Type "K" Soft Temper
Fittings:	Wrought copper solder joint.

2.3 BASIC PIPING SPECIALTIES

- A. Provide piping specialties complying with Section 220010 Basic Materials and Methods in accordance with the following listing:

- Pipe escutcheons
- Dielectric unions
- Drip pans
- Pipe sleeves
- Sleeve seals

2.4 SPECIAL PIPING SPECIALTIES

- A. Water Hammer Arresters: Provide bellows or piston type water hammer arresters, pressure rated for 250 psi, tested and certified in accordance with PDI Standard WH-201.

2.5 BASIC VALVES

- A. Provide valves complying with applicable Division 22 sections "Valves", in accordance with the following listing:
- B. Sectional Valves:
2-1/2" and Smaller: Ball Valves.
Gate Valves.

3" and Larger: Ball Valves.
Butterfly Valves.
- C. Shutoff Valves:
2-1/2" and Smaller: Ball Valves.
Gate Valves

3" and Larger: Ball Valves.
Butterfly Valves.
- D. Drain Valves:
All Hose End Threaded Gate or Ball Valves.
- E. Balancing Valves:
2" and Smaller: Ball Valves (Circuit Setter Type).
(with Memory Stop)
- F. Check Valves:
All Sizes: Swing Check Valves. Horizontal Installations
Spring Check Valves. Vertical Installations

2.6 SPECIAL VALVES

- A. Special valves required for domestic water piping systems include the following types:
- B. Hose Bibbs: Threaded end, renewable composition disc, tee handle, 3/4" NPT inlet, 3/4" hose outlet with vacuum breaker.

1. Finished Areas: Chrome plated.
2. Unfinished Areas: Bronze finish.
- C. Wall Hydrants: Non-freeze, cast-bronze body, tee handle key, bronze casing, length to suit wall thickness, vacuum breaker, hinged locking cover, 3/4" inlet, hose outlet.

2.7 SYSTEMS EQUIPMENT MANUFACTURERS

- A. Refer to Plumbing Fixture and Equipment Schedule for type, number, size and manufacturer of all equipment and accessories.

- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering equipment which may be incorporated in the work are limited to the following:

Shock Absorbers:

Zurn
Josam
Wade
Watts
Smith
PPP Inc.
MIFAB

PART 3 – EXECUTION

3.1 INSTALLATION OF BASIC IDENTIFICATION

- A. Install mechanical identification in accordance with Section 220010 Basic Materials and Methods.
- B. Support vertical piping at floor levels using approved riser clamps. Clamp material shall be compatible with pipe material. Maximum vertical spacing shall be 10'-0". Domestic water piping shall be supported in accordance with the International Mechanical Code, Section 305 and Table 305.4 Spacing Intervals, or in accordance with MSS-SP-69. International Plumbing Code's latest edition, Section 308.5, accept as follows:
1. Copper tubing ½" to 1-1/4" nominal size, not to exceed 6 ft. horizontal intervals.
 2. Copper tubing 1-1/2" and larger nominal size, not to exceed 10 ft. horizontal intervals.
 3. Copper tubing ½" to 1-1/4" nominal size, not to exceed 10 ft. vertical intervals.
 4. Copper tubing 1-1/2" and larger nominal size not to exceed 10 ft. vertical intervals.
 5. CPVC pipe or tubing ¼" to 1" nominal size, not to exceed 3 ft. horizontal spacing.
 6. CPVC pipe or tubing 1-1/4" and larger nominal size not to exceed 4 ft. horizontal spacing.
 7. CPVC pipe or tubing ¼" to 1" nominal size not to exceed 10 ft. vertical.
 8. CPVC pipe or tubing 1-1/4" and larger nominal size not to exceed 10 ft. vertical."
- *Mid-Story Guide.

3.2 INSTALLATION OF PIPING SPECIALTIES

- A. Install piping specialties in accordance with Section 220010 Basic Materials and Methods.
- B. Water Hammer Arresters: Install in upright position, in locations and of sizes in accordance with PDI Standard WH-201, and elsewhere as indicated.

3.3 INSTALLATION OF VALVES

- A. Install valves in accordance with Division 22 Basic Materials and Methods section, "Valves".
- B. Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves 2 or more fixtures, equipment connections, and elsewhere as indicated.

- C. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.
- D. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere where indicated or required to completely drain domestic water piping system.
- E. Check Valves: Install on discharge side of each pump, and elsewhere as indicated.
- F. Balance Cocks: Install in main recirculating loop and in each branch hot water recirculating loop. Install a ball valve and check valve at each balance valve installation.
- G. Hose Bibbs: Install on exposed piping where indicated, with vacuum breaker.

3.4 EQUIPMENT CONNECTIONS

- A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than required by International Plumbing Code.
- B. Equipment furnished by the Owner or Contractors other than this Contractor: After equipment has been set in place, this Contractor shall furnish all labor and material required to make final connections, between roughing-in and the equipment. Install valves, fittings, trim and appurtenances furnished with the equipment. All exposed piping in the kitchen areas shall be chrome plated. Piping in other areas shall be of the same material as the system to which it connects.

3.5 SPARE PARTS

- A. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

3.6 DOMESTIC HOT WATER RETURN

- A. This Contractor shall install complete and operating hot water return system. The system shall be balanced and include a report as required.
- B. Balancing Valves are required in the system as hereinbefore specified. The system shall also include the installation of “air bleed” or “burp” valves to remove any trapped air in the system.

END OF SECTION 22 01 20

SECTION 22 01 40

FIXTURES – PLUMBING

PART 1 – GENERAL

1.1 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.

1.2 DESCRIPTION OF WORK

- A. This Section includes:
 - 1. Plumbing fixtures and trim work as indicated by drawings and schedules, and by requirements of this section.
 - 2. Types of plumbing fixtures required for the project include the following:
 - Water Closets
 - Lavatories
 - Countertop Sinks
 - Manually Operated Flush Valves
 - Handicap Lavatory Insulation
 - Lavatory Shield Enclosure
 - Lavatory System
 - 3. Refer to Section 220120 for domestic water piping systems used in conjunction with plumbing fixtures; not work of this section.
 - 4. Refer to Section 220110 for soil and waste piping systems used in conjunction with plumbing fixtures; not work of this section.
 - 5. Refer to Division 26 sections for electrical connections to water coolers and other plumbing fixtures; not work of this section.

1.3 REFERENCE STANDARDS

- A. Refer to Section 220000 for a general description of requirements applying to this section.

1.4 QUALITY ASSURANCE

- A. Refer to Section 220010 for a general description of requirements applying to this section.
- B. Manufacturers: Firms regularly engaged in manufacture of plumbing fixtures of the type, style and configuration required, whose products have been in satisfactory use in similar service for not less than 3 years.

- C. Plumbing Fixture Standards: Comply with applicable portions of International Plumbing Code pertaining to materials and installation of plumbing fixtures.
- D. ANSI Standards: Comply with applicable ANSI standards pertaining to plumbing fixtures and systems.
- E. ANSI & ADA Standards: Comply with ANSI A171.1 Standard and the ADA Standard pertaining to plumbing fixtures and provisions for handicapped.
 - 1. Water closets shall be installed to heights indicated on the Architectural details. Bowls shall be elongated type.
 - 2. Flush valve mechanisms shall be on the wide side of the stall, no higher than 44" above the floor.
 - 3. Urinals shall be elongated (14" rim from the wall) See Architectural details for all elevations.
 - 4. Lavatories shall be mounted no higher than allowed by Architect's details from the floor and provide knee clearance using an offset drain assembly with "P" trap set parallel to the fixture supporting wall. Trap and wall supplies shall be installed for clearance required for the installation of lavatory shield enclosures.
 - 5. Faucets shall be lever operated, push type, touch type. See Fixture Schedule. All faucets shall operate on less than 5 pounds force and shall not require tight grasping, pinching or twisting of the wrist.
- F. PDI Compliance: Comply with standards established by Plumbing and Drainage Institute pertaining to plumbing fixture supports.
- G. Federal Standards: Comply with applicable FS WW-P-541/- Series sections pertaining to plumbing fixtures.
- H. UL Labels: Provide water coolers which have been listed and labeled by Underwriters' Laboratories.
- I. ARI Labels: Provide water coolers which are rated and certified in accordance with applicable Air-Conditioning and Refrigeration Institute Standards.

1.5 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 220000.
- B. Submit the following:
 - 1. Product Data: Submit manufacturer's specifications for plumbing fixtures and trim, including catalog cut of each fixture type and trim item furnished, roughing-in dimensioned drawings, templates for cutting substrates, fixture carriers, and installation instructions.
 - 2. Color Selection Data: Submit charts or samples for color selection where applicable.

3. Maintenance Data: Submit maintenance data and parts lists for each fixture type and trim item, including instructions for care of finishes. Include this data in maintenance manual.

1.6 WARRANTY/GUARANTEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver plumbing fixtures individually wrapped in factory-fabricated containers.
- B. Handle plumbing fixtures carefully to prevent breakage, chipping and scoring the fixture finish. Do not install damaged plumbing fixtures; replace and return damaged units to equipment manufacturer.

PART 2 – PRODUCTS

2.1 PLUMBING FIXTURES

- A. Provide factory-fabricated fixtures of type, style and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by the manufacturer and as required for a complete installation. Where more than one type is indicated, selection is Installer's option; but, all fixtures of same type must be furnished by single manufacturer. Where type is not otherwise indicated, provide fixtures complying with governing regulations.

2.2 MATERIALS

- A. Unless otherwise specified, comply with applicable Federal Specification WW-P-541/-Series sections pertaining to plumbing fixtures, fittings, trim, metals and finishes. Comply with the requirements of WW-P-541/-specification relative to quality of ware, glazing, enamel, composition and finish of metals, air gaps, and vacuum breakers, even though some plumbing fixtures specified in this section are not described in WW-P-541/-.
- B. Provide materials which have been selected for their surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, foundry sand holes, stains, decoloration, or other surface imperfections on finished units are not acceptable.
- C. Where fittings, trim and accessories are exposed or semi-exposed, provide bright chrome-plated or polished stainless steel units. Provide copper or brass where not exposed.
- D. Stainless Steel Sheets: ANSI/ASTM A-167, Type 302/304, hardest workable temper. Finish: No. 4, bright, directional polish on exposed surfaces.
- E. Steel Sheets for Baked Enamel Finish: ANSI/ASTM A-591, coating Class C, galvanized-bonderized.

- F. Steel Sheets for Porcelain Enamel Finish: ANSI/ASTM A-424, commercial quality, Type 1.
- G. Vitreous China: High quality, free from fire cracks, spots, blisters, pinholes, and specks; glaze exposed surfaces, and test for crazing resistance in accordance with ANSI/ASTM C-554.
- H. Fiberglass: ANSI Z124 smooth surfaced, with color selected by Architect/Engineer.
- I. Aluminum: ANSI/ASTM B-209/B-221 sheet, plate and extrusions, as indicated; alloy, temper and finish as determined by manufacturer, except 0.40 mil natural anodized finish on exposed work unless another finish is indicated.
- J. Synthetic Stone: High quality free from defects, glaze on exposed surfaces, stain resistant.

2.3 PLUMBING FITTINGS, TRIM AND ACCESSORIES

- A. Lavatory Protective Shield Covers:
 - 1. Fully molded enclosure "Lav Shields" as manufactured by Zurn or Truebro, Inc., complete with tamper-resistant stainless steel fasteners.
 - 2. Shield enclosure to meet A.D.A. #4.19.4, ANSI A117.1 and BOCA P- 1203.4.
- B. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, or dispensing devices, of type and size indicated, and as required to operate as indicated. Include manual shutoff valves and connecting system pipes to permit outlet servicing without shut- down of water supply piping systems.
 - 1. Vacuum Breakers: Provide with flush valves where required by governing regulations, including locations where water outlets are equipped for hose attachment.
- C. P-traps: Include removable P-traps where drains are indicated for direct connection to drainage system. All traps shall be minimum 17 gauge.
- D. Carriers: Provide cast-iron and/or steel supports for fixtures. Carriers shall be provided for all wall-hung fixtures, and/or the carrier shall be selected to support the fixture independently of the wall. Carriers shall be adjustable type, complete with all fittings and foot supports. Carrier shall be single or double, back-to-back, horizontal offset and vertical stack type. Carrier shall be selected and used as best suited within the pipe chases. Where noted or indicated, stud mount type carriers shall be used and installed within stud wall s 8" and less.
- E. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.
- F. Escutcheons: Where fixture supplies and drains penetrate walls in exposed locations, provide chrome plated sheet steel escutcheons with friction clips.
- G. Aerators: Provide aerators of types approved by Health Departments having jurisdiction.

- H. Comply with additional fixture requirements contained in fixture schedule attached to this section.

2.4 FIXTURE LIST

- A. Refer to the "Plumbing Fixture & Equipment Schedule" as indicated on the drawings.

2.5 SENSOR-OPERATED LAVATORY SYSTEM FAUCETS (BRADLEY)

- A. This Contractor shall furnish and install complete and operating sensor operational faucets where so indicated and noted. This shall include, but not be limited to, transformers and low voltage wiring.
- B. Electrical power wiring shall be provided at the pipe chases and lavatory wash stations as required by the Electrical Contractor. See Electrical Plans. All wiring beyond that point shall be considered control wiring and shall be the complete responsibility of the Plumbing Contractor.
- C. The Contractor shall have a complete understanding of the sensor operated equipment and system they are installing during the bid phase of the work. This includes all control wiring for the operation and function of the flush valves and faucets.
- D. The Contractor shall install the system in strict conformance with the manufacturer's written instructions. The installation shall be executed with good workmanship and to be clear of any interference with the user including the installation of lavatory protective shield enclosures.
- E. All faucet installations shall require a mixing valve for single water supply to faucet.
- F. All sensor wall-mounted boxes and/or panels, including setting heights, shall be strictly coordinated with the masonry contractor for both drywall and block wall installations.
- G. The Contractor shall coordinate the location of the electrical power junction box with Electrical Contractor including the installation of the transformer unit. The Plumbing Contractor shall provide an adequate sized access panel for maintenance and servicing of the transformer and junction box. The Contractor shall locate the junction box and transformer where best suited either above the ceiling or pipe chase wall.

2.6 AVAILABLE MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering fixtures, trim and carriers which may be incorporated in the work include, and are limited to the following:

Water Closets (Wall-Mounted Back Outlet – China)

Crane
American Standard
Sloan
Zurn

China/Enameled Fixtures

American Standard
Eljer
Crane
ToTo
Sloan
Zurn

Faucets/Trim (Non-Sensor Operated)

American Standard
Delta
Moen
Elkay
Speakman
Chicago
T&S Brass
Sloan

Lavatory System

Bradley
Acorn

Flush Valves

Sloan
Coyne & Delany
Zurn
ToTo

Wall Supplies/Traps

McGuire
Brass-Craft
Kohler
American Standard
Sanitary-Dash
Teledyne
Wolverine
Pro-Flo
Keeny

Fixture Carriers

Zurn
Josam
Wade
Watts
Smith
MIFAB

Fixture Seats

Olsonite
Sperzel
Benke
Bemis
Church
Kohler
American Standard
Centoco
Comfort Seat

B. Cross Reference Identification:

1. If the Contractor selects a manufacturer of drainage equipment products other than as identified on the Schedule but is selected from the available manufacturers listed above, a cover sheet shall be included with the submission of shop drawings indicating the cross referenced manufacturer and model number.
2. Shop drawings shall not be reviewed or accepted if not in compliance with this requirement.

2.8 HANDICAP LAVATORY INSULATION

- A. Fully molded "P" trap and angle valve insulation kit Handi-Lav Guard Truebro Model #101, 102 and 105 to suit.
- B. Insulation to meet A.D.A. #4.19.4, ANSI A117.1 and BOCA P- 1203.4.
- C. Self-extinguishing ASTM D635 burn characteristics, Thermal conductivity ASTM C177-K value 1.17.

PART 3 – EXECUTION

3.1 FIXTURE CONNECTIONS

- A. Connections to plumbing fixtures shall be of the sizes indicated on the "Plumbing Fixture & Equipment Schedule".
- B. The sizes indicated on the Schedule are for drainage and water piping serving an individual fixture; the sizes of the mains and branches shall be as indicated on the drawings.

3.2 FIXTURE SETTING HEIGHTS

- A. The plumbing fixtures shall be set in accordance with the heights established by the latest edition of codes and ADA requirements.

Note: Height indicated is established as follows:

Water Closets:	From finished floor to top of seat.
Urinals:	From finished floor to rim of fixture.

Lavatories & EWC:	From finished floor to rim of fixture.
Receptor Fitting:	From finished floor to center of fitting.
Shower:	From finished floor to center of shower head.

- B. Refer to Architectural drawings and sections for fixture elevations. Fixtures in various areas may be set at lower elevations. Confirm all rough-in elevations prior to any installation.

3.3 LAVATORY PROTECTIVE SHIELD ENCLOSURES

- A. Installation shall conform to manufacturer's written instructions.
- B. All items involved with wall-hung lavatory installations shall be roughed-in and installed within the enclosure. This includes the offset "P" trap assembly, thermostatic mixing valve, sensor faucet trim and accessories, electrical outlet. Coordinate all work required for complete concealment of all devices.
- C. Protective shield enclosures are required on the toilet room's countertop lavatories and are furnished by the Architect. Coordinate all trim and accessories to fit within this enclosure.

3.4 INSPECTION AND PREPARATION

- A. Examine roughing-in work of domestic water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until satisfactory conditions have been corrected.
- B. Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings, and with recognized industry practices. Ensure that plumbing fixtures comply with requirements and service intended purposes. Comply with applicable requirements of the International Plumbing Code pertaining to installation of plumbing fixtures.
- C. Fasten plumbing fixtures securely to indicated supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies behind or within wall construction so as to be rigid, and not subject to pull or push movement.

3.5 CLEAN AND PROTECT

- A. Fixture shall be thoroughly cleaned after completion of installation.
- B. Protect installed fixtures from damage during the remainder of the construction period.

3.6 FIELD QUALITY CONTROL

- A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

- B. Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove fixture and replace with new unit. Feasibility and match to be judged by Architect/Engineer. Remove cracked or dented units and replace with new units.

END OF SECTION 22 01 40

SECTION 22 01 90

TESTING – PLUMBING

PART 1 – GENERAL

1.1 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.

1.2 DESCRIPTION OF WORK

- A. Refer to Section 220005 for a general description of the scope of work in this contract.
- B. Extent of plumbing systems to be tested is indicated on the drawings and by requirements of this section.
- C. Applications of tests include the following:
 - 1. Interior Piping
 - a. Domestic cold, hot & hot water return piping
 - b. Sanitary and condensate waste drainage piping
 - c. Storm water drainage piping
- D. See Fire Protection Specifications for testing of Fire Protection Systems.

1.3 REFERENCE STANDARDS

- A. Refer to Section 220000 for a general description of requirements applying to this section.

1.4 QUALITY ASSURANCE

- A. Refer to Section 220010 for a general description of requirements applying to this section.

1.5 SUBMITTALS

- A. Submit test reports in accordance with Section 220000.

1.6 WARRANTY/GUARANTEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

PART 2 – PRODUCTS

2.1 PIPE & FITTING REPLACEMENTS

- A. Refer to Section 220010 for replacement of any defective pipe or fittings. Replacement shall include all required uncovering, excavating, recovering and backfilling.

PART 3 – EXECUTION

3.1 GENERAL

- A. All exterior or interior piping shall be tested and approved before backfilling or concealing. Failure to secure the approval of the Municipal Inspector, Utility Company's Inspector or the Inspector of the Architect/Engineer makes it mandatory for the Contractor to completely expose the piping for testing. All expense involved in the uncovering of the piping for the test and recovering shall be borne by the respective Contractor with no change in Contract.
- B. All equipment, material and labor required for testing a plumbing system or part thereof shall be furnished by the Plumbing Contractor responsible for installing the work.

3.2 INTERIOR PIPING

- A. Drainage Piping:

Rough Plumbing: The piping of all plumbing storm, condensate waste, sanitary drainage and venting systems shall be tested upon completion of the rough piping installation by water or air and proved watertight. Where required by the code official, the cleanout plugs shall be removed to ascertain if the pressure has reached all parts of the system. Either of the following methods shall be used:

1. Water Test: The water test shall be applied to the drainage system either in its entirety or in sections after rough piping has been installed. If applied to the entire system, all openings in the piping shall be closed, except the highest opening, and the system filled with water to the point of overflow. If the system is tested in sections, each opening shall be plugged except the highest opening of the section under test, and each section shall be filled with water, but a section shall not be tested with less than a 10-foot head of water.

In testing successive sections, at least the upper 10 feet of the next preceding section shall be tested, so that a joint or pipe in the building (except the uppermost 10 feet of the system) shall not have been subjected to a test of less than a 10-foot head of water. The water shall be kept in the system or in the portion under test for a minimum of 15 minutes before inspection starts. The system shall then be tight at all points.

2. Air Test: The air test shall be made by attaching an air compressor testing apparatus to an opening, and, after closing all other inlets and outlets to the system, forcing air into the system until there is a gauge pressure of 5 pounds per square inch (5 psi) or a minimum of 10-inch column of mercury. This pressure shall be held without introduction of additional air for a minimum period of 15 minutes.

Precautionary Note: The compressibility of air and/or other gases result in tremendous amounts of stored energy, even at lower pressures. Over-pressurizing creates a substantial hazard to personnel and property near the area should a failure occur. Consult with the Plastic Pipe Institute (PPI) for statements and alerts, along with State and local safety offices.

Finished Plumbing: Where required by the code official, after the plumbing fixtures have been set and their traps filled with water, their connections shall be tested and proved gas and water-tight by one of the following test methods.

1. The final test for gas and water-tightness of the completed drainage and vent systems shall be made by a smoke test or other approved method. The test shall be made by filling all traps with water, and then introducing into the system smoke produced by one or more smoke machines. When the smoke appears at stack openings on the roof, the stack openings shall be closed and a pressure equivalent to a 1" water column shall be built and maintained for the period of the inspection.
2. After the plumbing fixtures have been set and their traps filled with water, their connections shall be tested and proven gas and water-tight by plugging the stack openings on the roof and building drain where the drain leaves the building and with air introduced into the system equal to the pressure of a 1-inch water column. This shall be accomplished by the use of a "U" tube or manometer inserted in the trap of a water closet. Such pressure shall remain constant for the period of inspection without the introduction of additional air.

Building sewer test: The building sewer shall be tested by insertion of a test plug at the point of connection with the public sewer or individual sewage disposal system. The building sewer shall then be filled with water under a head of not less than 10 feet. The water level at the top of the test head of water shall not drop for at least 15 minutes.

- B. Domestic Water Piping: All new, altered, extended or replaced interior water piping installed shall be tested at 100 psig maintaining the pressure for four hours with not more than 1% drop in pressure. The system shall be filled with water which shall remain in the system until the water and the piping are the same temperature. If water pipe testing is under the jurisdiction of the local inspector, his requirements shall be used; however, they shall be not less than specified herein. The tests shall be performed in the presence of the representative of the Architect/Engineer and to his satisfaction.

3.3 STERILIZATION

- A. After final testing for leaks, all new potable water piping installed including water service piping, shall be flushed to remove foreign material.
- B. Before placing domestic water systems in service, a qualified service organization shall be engaged, to sterilize the entire building including the exterior water service piping in accordance with the following procedure:
 1. Contractor shall provide a 3/4" hose connection somewhere in the main entering the building, or in the Mechanical Room and/or in the meter pit, pump in sufficient sodium hypochlorite to produce a free available chlorine residual of not less than 100 PPM.

2. Proceed upstream from the point of chlorine application opening all faucets and taps until chlorine is detected. Close faucets and taps when chlorine is evident. Consult with the local code department for additional concentrations and durations.
3. When chlorinated water has been brought to every faucet and tap with a minimum concentration of 200 PPM chlorine, retain this water in the system for at least three hours.
4. At the end of the retention period, no less than 100 PPM of chlorine shall be present at the extreme end of the system.
5. Proceed to open all faucets and taps and thoroughly flush all new lines until the chlorine residual in the water is less than 1.0 PPM.
6. Obtain representative water samples from the system for analysis by a recognized Bacteriological Laboratory.
7. If all samples tested for impurities and organisms are negative, a letter and laboratory reports shall be submitted by the service organization to the contractor, certifying successful completion of the sterilization.
8. If any samples tested indicate the presence of harmful impurities and organisms, the entire sterilization procedure shall be repeated.
9. Plumbing Contractor shall provide plumbing connections and power for pumping chlorine solution into the system.

Warning: PVC and CPVC Pipe: Do not use a dry granular calcium hypochlorite as a disinfecting material for water purification in potable water piping systems. The introduction of granules or pellets of calcium hypochlorite with solvent cements and primers (including their vapors), may result in violent chemical reactions.

- C. Available Service Organizations: Subject to compliance with requirements, provide the sterilization service of one of the following:

Water Chem
Arc Company, Inc.
Nova Consultants
Artesian Water Co.

END OF SECTION 22 01 90

SECTION 22 01 91

BALANCING - PLUMBING

PART 1 – GENERAL

1.1 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.

1.2 DESCRIPTION OF WORK

- A. Refer to Section 220005 for a general description of the scope of work in this contract.
- B. Extent of plumbing systems to be balanced is indicated on the drawings and by requirements of this section.
- C. Applications of tests include the following:
 - 1. Interior Piping
 - a. Domestic hot water and hot water return

1.3 REFERENCE STANDARDS

- A. Refer to Section 220000 for a general description of requirements applying to this section.

1.4 QUALITY ASSURANCE

- A. Refer to Section 220010 for a general description of requirements applying to this section.

1.5 SUBMITTALS

- A. Submit balancing report in accordance with Section 220000.

1.6 WARRANTY/GUARANTEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

PART 2 – PRODUCTS

2.1 PIPE & FITTING REPLACEMENTS

- A. Refer to Section 220010 for replacement of any defective pipe or fittings. Replacement shall include all required draining of system, removal and replacement and uncovering, recovering.

PART 3 – EXECUTION

3.1 GENERAL

- A. All new hot water return piping installed or wherever system valves are being replaced, the system shall be tested, balanced and approved before concealing. Failure to secure the approval of the Municipal Inspector, A/E Inspector or the Inspector of the Owner makes it mandatory for the Contractor to completely expose the piping for balancing. All expense involved in the uncovering of the piping for the balancing and recovering shall be borne by the respective Contractor with no change in Contract.
- B. All equipment, material and labor required for balancing a plumbing system or part thereof shall be furnished by the Plumbing Contractor responsible for installing the work.

3.2 INTERIOR PIPING

- A. Domestic Hot Water Return System: Upon completion of the testing of the domestic hot water supply and recirculation systems, a final procedure is to be performed to obtain uniform circulation within each hot water loop of the domestic hot water system. At the ends of the hot water mains, or wherever a branch return line connects to the main return line, there shall be three (3) valves: ball valve, check valve and balancing valve. These valves are to be installed in an accessible space at/or above the ceiling or where indicated on the drawings.
- B. Based on an Accu-Flo balancing valve, the use of a differential pressure gauge Model No. 779 shall be used to achieve the greatest accuracy.

END OF SECTION 22 01 91

SECTION 23 02 00

GENERAL PROVISIONS - HVAC

PART 1 – GENERAL

1.1 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 work of this Section.
- B. This specification or drawing and the design features or resulting construction disclosed, are the property of Furlow Associates, Inc., and shall not be reproduced without written permission.
- C. All Mechanical Systems shall be part of and included in all of the following: 230200 thru 230950.

1.2 WORK INCLUDED

- A. Provide labor, materials, equipment and supervision necessary to install complete operating HVAC Systems, including all work at the site and within the proposed construction areas to accomplish the required work.
- B. Wherever the term "provide" is used, it shall be understood to mean both "furnish" and "install".

1.3 REGULATIONS, CODES AND STANDARDS

- A. Work shall be performed in accordance with latest adopted codes, regulations and ordinances by authorities having jurisdiction. Observe all safety regulations.
- B. Obtain all permits and inspection certificates and pay all charges.
- C. Latest editions of any referenced standards shall govern.

1.4 RELATED WORK

- A. Refer to equipment shown or specified in sections of Division 1 thru 14 and 26 that will require Mechanical services and provide such service.
- B. Refer to work related to HVAC as shown on the following contract drawings:
 - Architectural & Structural
 - Plumbing
 - Electrical
- C. This Contractor shall coordinate with the work of Division 26 and the Fire Alarm System vendor for locations and mounting of all duct smoke detectors. These devices are shown on the

Mechanical Drawings for reference only to show the intent of the work. All locations shall be determined based on approved shop drawings from the Fire Alarm System vendor and the Contractor for the work of Division 26, Electrical.

1.5 COORDINATION

- A. The Mechanical, Plumbing and Electrical Contractors are responsible to coordinate all manufacturer's recommended circuit breakers, starters, disconnects and fuse sizes for all equipment. Submission of a shop drawing will certify that this has been completed. Any necessary changes required will be included as part of this contract.
- B. Mechanical Contractor shall coordinate scheduling, submittals and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of independent work elements, with provisions to accommodate items that may be installed at a later time.
- C. Mechanical Contractor shall verify utility requirements and all characteristics of operating equipment are compatible with the building utilities. Coordinate the work of all sections related and required for installing, connection and placing in service of all equipment.
- D. Mechanical Contractor shall coordinate all space requirements, supports and installation of all mechanical, electrical, plumbing and fire protection work, which are indicated diagrammatically on the Drawings. Verify routing of all pipes, ducts, conduits and equipment connections. Maximize accessibility for other work, and service requirements for maintenance and repairs.
- E. Obtain written confirmation from all related trade Contractors and the Owner or his representative that requirements, conflicts and coordination issues have been discussed and resolved.
- F. Submit coordination drawings to verify access and clearances.

1.6 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations..
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installation within unheated shelters.

1.7 SUBMITTALS

A. Shop Drawings:

1. Shop drawings shall be submitted in accordance with Division 1 of these specifications except where herein modified.
2. Shop drawings comprising complete catalog cuts, performance test data for HVAC equipment as required by other sections of Division 23, shall be submitted for review checking. The Contractor shall review these shop drawings for conformance to contract documents prior to submission and affix contractor's signature to each submittal certifying that this review has been done. By approving and submitting shop drawings, product data, samples and similar materials, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction data that relates to the work, and has checked and coordinated this information with all of the requirements contained in the contract documents for the work of all trades.
 - a. The Contractor and equipment manufacturer shall clearly identify in all submittals and shop drawings any and all applications standards which require additional work to accommodate this equipment and provide a complete and operational system as described in the contract documents.
 - b. The Contractor shall be completely responsible for any and all additional costs associated with the changes required by this and all other trades.
3. All shop drawing submittals shall have the following identification data, as applicable, contained therein or permanently adhered thereto.
 - a. Project name.
 - b. Project number.
 - c. Sub-contractor's, vendor's and/or manufacturer's name and address.
 - d. Product identification.
 - e. Identification of deviation from contract documents.
 - f. Applicable contract drawings and specification section number.
 - g. Shop drawing title, drawing number, revision number, and date of drawing and revision.
4. Resubmit revised or additional shop drawings as requested.
5. Wherever shop drawings or vendor's standard data sheets indicate work to be done "by others", it shall be the responsibility of the contractor making the submission to identify by name, the contractor who is to do this work. If the contractor named is other than the contractor making the submission, the shop drawing submission must be reviewed by the named contractor and bear his mark of approval, prior to submission to the Architect/Engineer.
6. Where equipment proposed differs from that shown on the drawings or specified, he shall submit for approval drawings showing the manner in which the layout is affected by the substitution.

7. The Contractor shall keep one copy of approved shop drawings at the job site,, filed in a suitable metal container. The shop drawings shall be cataloged and kept in good repair, and shall be available for use by the Owner, Architect and Engineer.
 8. No equipment shall be ordered, fabricated, etc., before approval of shop drawings.
- B. Contractor is responsible for the shop drawing coordination and interface with the work of other contracts and adjacent work. The relationship of Contractor's work shall be verified as it relates to adjacent and critical features of the work of this and all contracts and materials.
 - C. The Contractor shall submit a complete schedule of all shop drawings required for the scope of work covering all materials and equipment listed in all sections of Division 23, Mechanical, including all documents required for contract closeout, Owner instructions and training, and all turnover items at the completion of the work. This schedule shall be submitted for review and approval within thirty days of contract award and before any subsequent materials are provided for review.
 - D. The shop drawings provided by the Contractor will be reviewed only once and resubmittals will be reviewed only once. Any other submittals will be billed to the Contractor at the Engineer's standard rates.

1.8 SITE INSPECTION

- A. The Contractor shall visit site, inspect, and become aware of all conditions which may effect the work during the estimation phase of his work prior to bid openings. Investigate utilities, protection requirements for adjacent facilities, storage locations, and access to the construction area.
- B. Submission of a bid will be deemed evidence of having complied with this requirement.

1.9 SUBSTITUTIONS

- A. Whenever a material, article, piece of equipment or system is identified in the following specification or indicated on the drawings by reference to manufacturers' or vendors' names, trade names, catalog numbers or the like, it is so identified for the purpose of establishing the basis of the Bid.
- B. Substitution approval must be obtained and included as an addendum item prior to the submission of the bid. An approved substitution shall not be considered as an approval for the Contractor or an equipment vendor to deviate from the written portion of the specifications unless so stated in the addendum.
- C. The drawings illustrate the space allocated for equipment and the Contractor shall install the equipment accordingly. If changes are required in the building or arrangement due to substitution of equipment, the Contractor making the substitution must pay for the necessary modifications.
- D. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall

include, but not be limited to all: space requirements, code clearances, type-horsepower-capacities-number and size of services required from other trades including all auxiliary items provided by this Contractor and all other trades, and all manufacturer's specific equipment applications standards and requirements, for approved equipment including that which is basis of design or a substitution. The bidding related contractor and equipment manufacturers shall clearly identify in all submittals and shop drawings any and all applications standards which require additional work to accommodate this equipment and provide a complete and operational system as described in the contract documents. If the bidding contractor or manufacturer does not comply with these requirements then they shall be completely responsible for any and all additional costs associated with the changes required by this and all other trades.

1.10 LUBRICATION

- A. Provide and maintain all required lubrication of any equipment operated prior to acceptance by the Owner. Lubrication shall be as recommended by the equipment manufacturer.
- B. Provide one year's supply of lubricants to Owner at date of acceptance.
- C. Verify that required lubrication has taken place prior to any equipment start-up.

1.11 EQUIPMENT START-UP

- A. Verify proper installation by manufacturer or his representative.
- B. Advise Construction Manager 2 days prior to actual start-up.
- C. Verify proper operation. Obtain signed statement by manufacturer or his representative that equipment is operating within warranty requirements. Submit statement to Construction Manager.
- D. Perform field mechanical balancing in accordance with Section 230950: TESTING AND BALANCING OF MECHANICAL SYSTEMS.
- E. The Mechanical Contractor shall own as part of his work, the following:

Provide one (1) additional drive set, if necessary, to obtain final design balancing requirements. The Mechanical Contractor shall coordinate with Balancing Firm and equipment manufacturer for drive selection, including belts and pulleys.

1.12 OPERATION & MAINTENANCE INSTRUCTIONS

- A. Properly and fully instruct Owner's personnel in the operation and maintenance of all systems and equipment.
 - 1. Provide one (1) 4-hour session of training to School District Maintenance Staff.
- B. Insure that the Owner's personnel are familiar with all operations to carry on required activities.
- C. Such instruction shall be for each item of equipment and each system as a whole.

- D. Provide report that instruction has taken place. Include in the report the equipment and/or systems instructed, date, contractor, Owner's personnel, vendor, and that a complete operating and maintenance manual has been reviewed.
- E. Manual shall include all instructions on operation, maintenance, repair parts list, lubrication requirements, brochures, catalogue cuts, complete schedule of air filters for each unit type in Excel spreadsheet format, wiring diagrams, piping diagrams, control sequences, service requirements, names and addresses of vendors, suppliers and emergency contacts. Three manuals shall be provided.
- F. Submit manuals for review prior to operating instruction period. Manuals shall be 8-1/2 x 11" with hard cover, suitably bound.
- G. Provide to the Owner any special tools necessary for operation and routine maintenance of any of the equipment.
- H. Upon completion of the project, the Mechanical Contractor shall provide a complete set of legible as-built drawings for the Owner.

1.13 TOOLS

- A. All equipment furnished by the Mechanical Contractor which requires special tools or devices other than those normally available to the maintenance or operating staff shall be furnished in duplicate to the Owner, sufficiently marked, packed or boxed for staff usage. The tools provided shall be listed by the Mechanical Contractor identified as to their use or the equipment applicable in a written transmittal to the Owner.

1.14 CLEANING AND FINISHING

- A. After equipment start-up and all operating tests have been made and the system pronounced satisfactory, each respective Contractor shall go over the entire project, clean all equipment, etc., installed by him and leave in a clean and working condition. Any surfaces found marred after this final cleaning shall be refinished or replaced by each Contractor at no cost to the Owner.
- B. Provide for the safety and good condition of all materials and equipment until final acceptance by the Owner. Protect all materials and equipment from damage. Provide adequate and proper storage facilities during the progress of the work. Special care shall be taken to provide protection for bearings, open connections, pipe coils, pumps, compressors and similar equipment.
- C. All fixtures, piping, finished surfaces and equipment shall have all grease, adhesive labels and foreign materials removed.
- D. All piping shall be drained and flushed to remove grease and foreign matter. Pressure regulating assemblies, traps, and similar items shall be thoroughly cleaned. Remove and thoroughly clean and reinstall all liquid strainer screens after the system has been in operation ten (10) days.

- E. When connections are made to existing systems, the Mechanical Contractor shall do all cleaning and purging of the existing systems required to restore them to the condition existing prior to the start of work.
- F. Clean-up: Remove from the premises, all unused material and debris resulting from the performance of work under this section.

PART 2 – PRODUCTS

2.1 GENERAL

- A. All material and equipment shall be new and of present day manufacture, and shall conform to accepted standards of the trade where such a standard has been established for the particular type of equipment or material.
- B. Whenever equipment or material is referred to in the singular, such as "the fan", it shall be deemed to apply to as many such items as necessary to complete the work.

2.2 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. During loading, transporting and unloading exercise care to prevent damage to material.
- B. Store all materials in dry enclosures or under protective coverings out of way of work progress.
- C. Material shall not be allowed to be stored directly on ground.
- D. Deliver in manufacturer's original cartons or on skids.
- E. Handle and protect so as to prevent damage to product or any surrounding material.

2.3 CONCRETE

- A. Concrete shall be in accordance with Section 033000.

2.4 WARRANTY

- A. Wherever in the specification sections of this division, reference is made to a specific warranty period, this warranty shall be in addition to and not a limitation of other rights the Owner may have against the Mechanical Contractor under the contract documents.

PART 3 – EXECUTION

3.1 PROTECTION

- A. Plug or cap open ends of piping systems, conduit and ductwork.
- B. Stored materials shall be covered to prevent damage by inclement weather, sun, dust or moisture.
- C. Protect all installed work until accepted in place by the Owner.

- D. Plates, polished metal escutcheons, thermostats and other finished devices shall not be installed until masonry, tile, and painting operations are complete unless otherwise protected.
- E. Protect all work from operations which may cause damage such as hauling, welding, soldering, painting, insulating and covering.

3.2 WORKMANSHIP

- A. Install all work neat, trim and plumb with building lines.
- B. Install work in spaces allocated.
- C. Cutting and patching shall be performed by skilled tradesmen normally employed for the work involved.
- D. This Contractor shall provide a complete weathertight seal to all new systems in the building including the necessary caulking, weather-stripping and insulation.

3.3 EQUIPMENT SETTING

- A. Provide as a minimum, a 4 inch concrete pad beneath all floor-mounted equipment. Install anchor bolts in pour.
- B. Provide as a minimum, spring vibration isolation under any equipment 10 HP and over and rubber in shear vibration isolation on any equipment up to 10 HP. For further specifications and additional requirements, refer to other sections.
- C. Concrete shall be 3,000 psi, 28 day compressive strength in accordance with ACI-613. Reinforce with No. 4 rod 12" on centers both ways or as otherwise detailed.

3.4 FASTENERS, HANGERS AND SUPPORTS

- A. Provide all hangers and supports required to suspend, mount, or hang the work.
- B. Provide all miscellaneous steel angles, channels, beams, clips, brackets and anchors necessary to hang or support the work. Provide submissions for review.
- C. Install concrete inserts before concrete is poured.
- D. Drilled inserts shall not be loaded more than 1/4 rated capacity.
- E. Power-driven fasteners shall not be allowed for piping larger than 2 inch, or equipment. When used they shall not be loaded more than 1/8 rated capacity or 200 pounds.
- F. All hangers, miscellaneous steel, braces and supports shall be galvanized, cadmium plated, or primed steel. Copper tubing shall be supported with copper hangers.

- G. Piping shall be supported from adjustable clevis type hangers with insulation pipe saddles or pipe shields in accordance with piping support spacing table on the drawings. Where hangers are 18" or longer provide lateral bracing at every fourth hanger.
- H. Any lintels required for openings for this work if not indicated on Architectural or Structural drawings shall be provided under this Section.

3.5 SLEEVES

- A. Provide each pipe, duct or conduit passing through a masonry or concrete wall, floor or partition with a sleeve made from standard weight steel pipe for pipe or conduit and No. 12 gauge galvanized steel for ducts, with smooth edges, securely and neatly cemented in place. Provide each pipe, duct or conduit passing through a frame or metal partition with a sleeve made from No. 22 gauge galvanized sheet metal, securely fastened in place.
- B. Be responsible for the proper location and alignment of all sleeves.
- C. Provide hydrostatic seals for sleeves passing through outside walls, either above or below grade, or through hydrostatically sealed slabs or floors on grade. Provide fire-rated seals for all sleeves which penetrate fire-rated walls.
- D. Install both piping and sleeve seals so as to maintain integrity of seals with expansion and contraction of piping.
- E. Set floor sleeves flush 1" above the floor in mechanical rooms, pipe chases, pipe spaces and other unfinished areas, unless otherwise indicated, and flush with the underside of slabs. Extend wall and partition sleeves through and cut flush with each surface unless otherwise indicated or specified.
- F. Select sleeves two pipe sizes larger than any pipe or conduit that is to remain uncovered, unless otherwise required by the sealing method specified. Where pipes are to be covered, provide sleeves large enough to allow the covering to pass through the sleeves with sufficient clearance for sealing as specified hereinafter. Size sleeves for branch piping from vertical risers large enough to permit vertical expansion at the riser.
- G. Select duct sleeve sizes to suit requirements of fire dampers and sealing methods as specified.
- H. Place sleeves imbedded in concrete floors or walls in the forms before concrete is poured; sleeves shall have integral waterstop flanges, where they are to receive either watertight or hydrostatic seals.
- I. Install sleeves passing through above-grade floors of mechanical rooms, toilet rooms, kitchens or similar service areas where liquid leaks or spillover may occur in a watertight manner. Sleeves shall be such that waterproofing membrane can be flashed around and into the sleeve where necessary.
- J. Hydrostatic Sealing Method: Provide compressible synthetic rubber seals, equivalent to LINK SEAL, manufactured by the Thunderline Corporation, or THRUWALL manufactured by O.Z. Gedney. Install seals in accordance with the manufacturer's recommendations to provide air

tightness aboveground and hydrostatic sealing belowgrade. Caulking or other type mastic is not acceptable.

K. Fire-Rated Sealing Method:

1. Sleeves, openings and sealants shall comply with applicable codes, recommended practices and standards, and manufacturer's instructions. Fire sealants shall have ability to prevent spread of flame, smoke or water throughout the penetration and shall pass 3 hour test, UL test ASTM E814 and UL 1479.
2. Products: Chase Corporation CTC PR-855, O. Z. Gedney CRS/CAFS, 3M Electro-Products Division Putty 303 or Caulk CP25 penetration sealing kits, General Electric Company sealants type RTV-850, 6428 or 7403, Thunderline Corporation "Link-Seal Pyro-Pak". Installation and type of sealant to be used as recommended by the manufacturer.

3.6 PLATES

- A. Provide chrome plated plates wherever piping passes into finished area.
- B. Plates shall be securely fastened to piping or building construction.
- C. Floor plates shall cover 1 inch sleeve extension.

3.7 OFFSETS, TRANSITIONS, MODIFICATIONS

- A. Provide all offsets necessary to install the work and to provide clearance for other trades.
- B. Maintain adequate headroom and clearance.
- C. Incidental modifications necessary to the installation of the systems shall be made as necessary and as approved by the Architect.

3.8 RECESSES

- A. Furnish information to the Construction Manager as to sizes and locations of recesses required to install panels, boxes, and other equipment or devices which are to be recessed in walls.
- B. Make offsets or modifications as required to suit final locations.

3.9 LABELING

- A. All HVAC equipment such as pumps, fans, air handling units, and devices requiring identification for operating procedures shall be provided with permanent black laminated micarta white core labels with 3/8 inch letters.
- B. This shall also apply to all controllers, remote start/stop pushbuttons and equipment cabinets.
- C. This shall not apply to individual room thermostats.

- D. All Mechanical Rooms shall be identified with a permanent placard of red-white-red laminated, commercial grade, plastic construction. Letters shall be minimum one inch high and read in capital letters: **WARNING – MECHANICAL EQUIPMENT ROOM – LIMITED ACCESS**. Placard shall be centered on each door leading into the mechanical room at five feet above the floor and attached at each corner with brass screws.
- E. At all fire damper locations, access doors in ductwork shall be identified with a permanent placard of red-white-red laminated commercial grade plastic construction, minimum one-half inch high capital letters, reading, **“FIRE DAMPER”** as appropriate for the installation. Attached securely to face of access door with brass screws at each corner, sealed airtight.

3.10 FLASHING AND COUNTERFLASHING

- A. Roof curbs, etc., shall have counterflashing fittings. General Contractor shall provide flashing.
- B. Piping and conduit thru the roof shall be flashed by the General Contractor. Provide counterflashing.
- C. Provide curbs with base features required to match roof materials, finishes and configuration; e.g., flat, sloped, raised seam, etc.

3.11 ACCESS

- A. Locate all equipment, valves, devices and controllers which may need service in accessible places.
- B. Where access is not available, access panels shall be provided. Furnish access panels to the Construction Manager for installation.
- C. Access panels shall be Nailor-Hart Industries, Karp Co., or Controlled Air Manufacturing Limited, with 16 gauge frames and 14 gauge steel door, prime painted.
- D. Maintain access clearances for fan removal, coil pulls, and filter removal.

3.12 WIRING AND MOTOR CONTROLS

- A. Packaged equipment shall be furnished with disconnect switches, starters, overloads, factory furnished and wired by the unit manufacturer.
- B. Roof-mounted exhaust fans, except utility sets, rated less than 1/2 HP at 115 volts, single phase, shall be furnished with disconnect switches, factory furnished and wired by unit manufacturer.
- C. Rooftop equipment shall be furnished with starters, disconnect switches, overloads, factory furnished and wired by unit manufacturer.
- D. This Contractor shall furnish all information and assistance required for the Electrical Contractor to purchase all motor starters that are not specified to be part of the mechanical equipment.
- E. Control wiring shall be provided under this Division of the work.

- F. All wiring shall be in accordance with the National Electrical Code and as recommended by the equipment manufacturer.

3.13 UTILITIES

- A. Do not interrupt any utility or service to the Owner without adequate previous notice and schedule.

3.14 OPENINGS - CUTTING, REPAIRING

- A. This Contractor shall cooperate with the work to be done under other sections in providing information as to openings required in walls, slabs and footings for all piping, ductwork and equipment, including sleeves where required.
- B. Any drilling or cutting required for the performance of work under this Section, shall be the responsibility of this Contractor and the cost thereof shall be borne by him.
- C. Holes in Concrete: Sleeves shall be furnished, accurately located and installed in forms before pouring of concrete. This Contractor shall pay all additional costs for cutting of holes as the result of the incorrect location of sleeves. All holes through existing concrete shall be either core drilled or saw cut. All holes required shall have the approval of the Structural Engineer prior to cutting or drilling.
- D. It shall be the responsibility of this Contractor to ascertain that all chases and openings are properly located.

3.15 PAINTING (DESIGNER NOTE: COORDINATE WITH ARCHITECT)

- A. Refer to the Construction Manager's Scope of Work for painting.

3.16 GUARANTEE

- A. All work shall be guaranteed to be free from defects for a period of one year of operation from date of acceptance by the Owner.
- B. Guarantee shall be extended on an equal time basis for all non-operational periods due to failure within the guarantee period.
- C. All materials and equipment provided and/or installed under this section of the specifications shall be guaranteed for a period of one year from date of acceptance of the work by the Owner unless otherwise specified in Division 1. Should any trouble develop during this period due to defective materials or faulty workmanship, the Mechanical Contractor shall furnish necessary labor and materials to correct the trouble without any cost to the Owner. Any defective materials or inferior workmanship noticed at time of installation and/or during the guarantee period shall be corrected immediately to the entire satisfaction of the Owner.

- D. In the event of occupancy by the Owner prior to final acceptance of the project, the guarantee date for equipment placed in operation shall be mutually agreed to by the Mechanical Contractor and the Owner's representative.

3.17 DRAWINGS

- A. The Mechanical Systems are indicated on the Contract Drawings. Certain pertinent information and details required by the Mechanical Work appear on the Architectural, Structural and Electrical Drawings; become familiar with all drawings, and incorporate all pertinent requirements.
- B. Drawings are diagrammatic and indicate the general arrangement of systems and requirements of the work. Do not scale drawings. Exact locations of fixtures and equipment, not specifically shown, shall be obtained before starting work.

3.18 TESTING AND BALANCING OF MECHANICAL EQUIPMENT

- A. Perform field mechanical balancing in accordance with Section 230950: TESTING AND BALANCING OF MECHANICAL SYSTEMS.
- B. The Mechanical Contractor shall own as part of his work, the following:

Provide one (1) additional drive set, if necessary, to obtain final design balancing requirements. The Mechanical Contractor shall coordinate with Balancing Firm and equipment manufacturer for drive selection, including belts and pulleys.

END OF SECTION 23 02 00

SECTION 23 02 10

BASIC MATERIALS AND METHODS – HVAC

PART 1 – GENERAL

1.1 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 Section 230200 for HVAC General Provisions.
- C. Refer to other sections in Division 23 for materials and methods not specified herein.

1.2 DESCRIPTION OF WORK

- A. Included in this Section are the following:
 - 1. Steel Pipe and Fittings
 - 2. Copper Tubing & Fittings
 - 3. Strainers
 - 4. Thermometers
 - 5. Gauges
 - 6. Test Stations - Pressure/Temperature
 - 7. Isolating Fittings
 - 8. Unions
 - 9. Motors

1.3 REFERENCE STANDARDS

- A. Refer to Section 230200 for a general description of requirements applying to this section.
- B. Install work to meet the requirements of the following:
 - 1. City of Wilmington Dept. of License and Inspections
 - 2. International Mechanical Code
 - 3. Gas Utility Company
 - 4. NFPA
 - 5. OSHA
 - 6. ASHRAE
 - 7. Manufacturer's Standardization Society (MSS) of the valve and Fittings Industry, Inc.:
 - SP-58 Pipe Hangers and Supports Materials, Design and Manufacture.
 - SP-69 Pipe Hangers and Supports Selection and Application
- C. Appliances and materials governed by UL requirements shall meet such requirements and bear the label.

1.4 QUALITY ASSURANCE

- A. Provide adequate supervision of labor force to assure that all aspects of the specifications are being fulfilled.
- B. Verify that all work and equipment is installed in accordance with manufacturer's warranty requirements.

PART 2 – PRODUCTS

2.1 STEEL PIPE AND FITTINGS

- A. Water Piping:
 - 1. ASTM A53 seamless, Schedule 40.
 - 2. Fittings up to 2 inch shall be 150 lb. malleable iron, screwed pattern ASME B16.3. Butt weld , ASME B16.9, same thickness as pipe.
 - 3. Fittings 2-1/2" and larger shall be butt weld ASME B16.9, same thickness as pipe.
 - 4. Weld-O-Lets and Thread-O-Lets shall be maximum of two sizes smaller than main size; i.e., maximum of a 2-inch Weld-O-Let on a 3-inch pipe.
 - 5. Thread tape shall be Teflon tape, 3 mils minimum thickness.

2.2 COPPER TUBING & FITTINGS

- A. Refrigeration Piping:
 - 1. Copper tubing: Type ACR, hard drawn temper.
 - 2. Fitting: Wrought-copper, solder joints, ASME B16.22 or ASME B16.26.
 - 3. Joints: Brazed, American Welding Society (AWS) Class BCUP-5 for brazing filler metal.
- B. Water Piping:
 - 1. Tubing: Hard drawn seamless ASTM B-88 Type "L" aboveground.
 - 2. Soft seamless ASTM B-88 Type "K" below-ground.
 - 3. Joint Material: Brazed joints, low temperature silver-bearing solder.
 - a. Flux shall be non-toxic type and non-corrosive.
 - 4. Fittings: ASME B16.15, B16.18, B16.22, or B16.26.

C. Condensate Drain Piping:

1. Pipe: Copper tubing Type DWV.
2. Fittings: Wrought copper solder type drainage fittings, ASME B16.23 or B16.29.

2.3 STRAINERS

- A. Perforations: .033" pipe size to 2", .057" pipe size 2-1/2" to 4", 1/8" pipe size 6" and up.
- B. Self-cleaning "Y" type screwed end up to 2 inch with machined seats with blow-off outlet, stainless steel screen, iron body.
- C. Self-cleaning "Y" type flanged 2-1/2 inch and up, with bolted cover flange, blow-off outlet, 125 psi ANSI, brass screen.
- D. Manufacturer: Muesco, Sarco, Hoffman Specialties, Metraflex, Armstrong, Keckley.

2.4 THERMOMETERS

- A. Separable socket, inserted into fluid flow, adjustable, hermetically sealed, red or blue indicating fluid, non-toxic, die-cast, baked enamel finish, double strength glass lens, white scale and black graduations.
- B. Scale: Chilled Water - 0° to 100°F
- C. Manufacturer: U.S. Gauge, H.O. Trerice, Moeller, Duro, Miljoco Corp., Winter Instruments.

2.5 GAUGES

- A. Phosphor bronze bourdon tube, polypropylene case, gasketed glass crystal, aluminum dial, black graduations 4-1/2 inch diameter.
- B. Range: 0 to 60 psi, 5 pound intervals, 1/2 pound graduations.
- C. Manufacturers: Danton, U.S. Gauge, H.O. Trerice, Moeller, Miljoco Corp., Winter Instruments.
- D. Install with bronze gauge cock.

2.6 TEST STATIONS – PRESSURE/TEMPERATURE

- A. Provide a SISCO 1/4 " or 1/2 " NPT fitting (Test Plug) of solid brass at desired indicated locations. Test plug shall be capable of receiving either a pressure or temperature probe 1/8" o.d. Dual seal core shall be neoprene for temperature to 200°F. Nordel to 350°F and shall be rated zero leakage from vacuum to 1000 psig. P/T plug to have grooved cap and chain.
- B. P/T plugs shall be provided with extensions as required by insulation.

- C. Mechanical Contractor shall also provide the following: pressure gauge adapters with 1/8" o.d. probe, 5" stem pocket testing thermometers for 25° to 125°F (tower and chilled water) for 0° to 220 °F (hot water) for 50° - 500°F (temperatures above 220°F).
- D. One (1) Master Test Kit shall be furnished to the Owners. Kit shall contain one (1) 2 ½ " test gauge of suitable range, one (1) Gauge Adapter 1/8" o.d. probe, and 5" stem pocket testing thermometers - one (1) 0° - 220°F and one (1) 50° - 550°F.
- E. Manufacturer: Sisco P/T Plugs.

2.7 ISOLATING FITTINGS

- A. Provide isolating fittings between all sections of dissimilar piping materials or piping and equipment where one material is ferrous and the other is non-ferrous.
- B. Manufacturer: Epcos Sales, Inc., or insulated unions by Central Plastic Co.

2.8 UNIONS

- A. Up to and including 2 inch pipe size: Screwed pattern, bronze-to- bronze seat.
- B. Above 2 inch pipe size: Flanged pattern, A.S.A. forged steel, with gaskets, bolts and nuts.
- C. Copper tubing unions shall have sweated type ends. Flanged unions on copper tubing may be soldered connections.
- D. Materials and pressure ratings shall be the same as specified for the respective pipe and fitting system unless otherwise specified.

2.9 MOTORS

- A. All single phase and polyphase motors shall be manufactured to incorporate the latest NEMA standards.
- B. All single phase and polyphase motors shall have steel frames with ball bearings and copper windings. All motors to have a Class "F" insulation system with a service factor of 1.15.
- C. All motors shall be 1725 RPM, 4 pole design, unless otherwise noted on the drawings, or in the equipment specifications.
- D. Motors installed indoors and not exposed to moisture shall be open, drip proof, Class B temperature rise based on 40°C maximum ambient temperature.
- E. Motors installed outdoors and exposed to moisture shall be totally enclosed, fan cooled, Class B temperature rise based on 40 deg. C maximum ambient temperature.
- F. Based on NEMA Standards, motors shall comply with the following minimum nominal efficiencies at full load.

Nominal Efficiencies for “NEMA Premium™” Induction Motors Rated 600 Volts or Less (Random Wound)						
	Open Drip-Proof			Totally Enclosed Fan-Cooled		
HP	3500 RPM	1800 RPM	1200 RPM	3500 RPM	1800 RPM	1200 RPM
1	82.5	85.5	77.0	82.5	85.5	77.0
1.5	86.5	86.5	84.0	87.5	86.5	84.0
2	87.5	86.5	85.5	88.5	86.5	85.5
3	88.5	89.5	85.5	89.5	89.5	86.5
5	89.5	89.5	86.5	89.5	89.5	88.5
7.5	90.2	91.0	88.5	91.0	91.7	89.5
10	91.7	91.7	89.5	91.0	91.7	90.2
15	91.7	93.0	90.2	91.7	92.4	91.0
20	92.4	93.0	91.0	91.7	93.0	91.0

G. Motor Characteristics: Refer to Equipment Schedules for specific data.

120/208 Volt System: Motors 1/2HP & Larger - 208V, 3 Phase, 3 Wire
Motors Less than 1/2HP- 120V, 1 Phase, 2 Wire

277/480 Volt System: Motors 1/2HP & Larger - 480V, 3 Phase, 3 Wire
Motors Less than 1/2HP-120/277V, 1 Phase, 2 Wire.

H. All motors rated less than 1/2HP shall have thermal protection of the auto-reset type as an integral part of the motor.

I. All motors rated 1/2HP and larger shall have thermal protection provided by an external device.

J. Whenever a variable frequency PWM drive is installed to control an AC motor, a maintenance-free, circumferential, conductive micro fiber shaft grounding ring shall be installed on the AC motor drive end to discharge shaft currents to ground. Recommended part: AEGIS SGR™ Bearing Protection Ring, as made by Electro Static Technology. Install in accordance with the manufacturer’s written instructions.

PART 3 – EXECUTION

3.1 PIPING SYSTEMS

- A. All piping to drain to low points. Low points shall be provided with drain valves with hose thread.
- B. All piping shall be arranged to have air vents at high points.
- C. Do not install trapped lines where water cannot be drained or air can accumulate without being vented.

- D. Piping shall run square with building lines.
- E. Piping shall not be insulated or covered until tested.
- F. Necessary drains, off-sets, vents and drips shall be provided for coordination of the work as part of the contract.
- G. Running or close nipples are not permitted.
- H. Piping shall not be installed over electrical transformers, panels, switchgear, substations, and control panels. No piping shall be installed in elevator machine rooms.
- I. Exposed insulated piping risers in unfinished spaces shall be covered with 22 gauge galvanized steel sleeves from floor to ceiling. Refer to Section: Insulation & Covering – HVAC for additional requirements.
- J. Allow clearance for expansion and contraction.
- K. Install eccentric piping fittings where change in sizes occurs in piping systems. Tops of pipes to remain level.
- L. Install isolating fittings between sections of ferrous and non-ferrous pipe or connected equipment.
- M. Do not support piping from other piping, conduits or equipment.
- N. Strainers shall be installed on suction of all pumps, inlets of control valves, and where indicated on drawings.
- O. Thermometers and gauges shall be installed where indicated on the drawings, required by equipment specifications and where indicated elsewhere in the specifications.
- P. Flexible connectors shall be provided on suction and discharge piping of all base mounted pumps.
- Q. Unions shall be provided adjacent to all valves, at equipment connections, and where necessary to facilitate dismantling of the piping system.
- R. Material Requirements for Systems:
 - 1. Heating Hot Water Supply & Return Piping:
 - a. Schedule 40 black steel.
 - b. Type L hard copper.
 - 2. Chilled Water Supply & Return Piping:
 - a. Schedule 40 black steel.
 - b. Type L hard copper.
 - c. Grooved End black steel.

3. Condensate Drain (including pumped condensate):

a. Type DWV copper.

4. Refrigerant Piping: Type ACR hard copper.

3.2 TAGS, CHARTS AND IDENTIFICATION

- A. See Paragraph "Labeling" in GENERAL PROVISIONS for equipment labeling.
- B. Identify each valve in all systems with black, numbered and stamped 1- 1/2" brass or aluminum tags fastened to valve by brass chain and S-hook.
- C. Provide 1/8" scale diagrams showing location, number and service or function of each tagged item.
 - 1. Frame diagrams in approved metal frames with clear acrylic front, hinges, and locks.
 - 2. Secure to wall in Mechanical Room.
 - 3. Provide two additional separate copies permanently covered and bound.
 - a. Include one (1) copy in the Operation and Maintenance Manuals.
- D. Piping Identification: Identify piping with Seton "Setmark" or Brimar, semi-rigid plastic, wraparound pipe markers with flow arrows and conforming to ANSI A13.1. Locate marker at each valve, changes in direction, where pipes pass thru barriers and every 25' of horizontal runs. Lettering on background shall be in accordance with the following colors:

Legend	Background	Lettering
1. Chilled Water Supply	- Green	- White
2. Chilled Water Return	- Green	- White
3. Gas	- Yellow	- Black
4. Heating Water Supply	- Yellow	- Black
5. Heating Water Return	- Yellow	- Black
6. Refrigerant Liquid	- Yellow	- Black
7. Refrigerant Gas	- Yellow	- Black

E. Provide color coded 1” diameter markers on ceiling tile grids to indicate system and valve locations.

Chilled Water: - Blue
Hot Water: - Red

F. Manufacturers: Seton “Setmark”, Brimar, B-Line MSI.

3.3 WELDING

- A. All concealed and inaccessible black steel piping shall be welded.
- B. All black steel piping larger than 1-1/4 inch may be fusion welded.
- C. All elbows, tees and branch connections shall be made with welding fittings ANSI B16.9.
- D. Welding shall be in accordance with the ASME Boiler and Pressure Vessel Code Section IX.
- E. Furnish welder test certificate for review. Certificates of successful qualification by the following organizations shall be acceptable.
 - 1. ASME Boiler and Pressure Vessel Code
 - 2. ANSI Code for Pressure Piping
 - 3. National Certified Pipe Welding Bureau
 - 4. Military Specification MIL-STD-248

3.4 SOLDERING/BRAZING

- A. Connections between copper tubing and copper fittings shall be made with the appropriate filler metal. Flux shall be non-corrosive type as recommended by the manufacturer of the filler metal, and conforming to AWS A5.8.
- B. Tubing shall be cut square and then reamed and deburred. End of tubing and inside of fitting cup shall be cleaned with steel wool and the flux shall be applied to the clean surface before joining. After joining, the excess filler metal shall be wiped off while still plastic.
- C. Silver brazing alloy shall be equal to Easy-Flo by Handy and Harmon or Sta-Brite silver solder and shall be used for joints in:
 - 1. Hot water heating piping
 - 2. Chilled water piping
 - 3. Air conditioning drain piping
- D. Where the silver brazing is performed in a confined non-ventilated space, a non-toxic, cadmium-free brazing alloy such as braze 560 by Handy & Harman shall be used.
- E. Refrigerant piping shall be silver brazed using Harris Sil-Fos 15 or equivalent, with nitrogen purge.
- F. Bring joint to solder temperature or brazing temperature in as short a time as possible.
- G. Form continuous solder bead or brazing filler bead around entire circumference of joint.
- H. Wipe excess solder from joint area while solder is still plastic.

END OF SECTION 23 02 10

SECTION 23 02 15

VALVES

PART 1 – GENERAL

1.1 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 Section 230200 for HVAC General Provisions.
- C. Refer to other sections in Division 23 for materials and methods not specified herein.

1.2 DESCRIPTION OF WORK

- A. This Section includes the following:
 - 1. General
 - 2. Chilled Water Systems
 - 3. Hot Water Heating System
 - 4. Refrigerant Valves and Specialties

1.3 QUALITY ASSURANCE

- A. Provide adequate supervision of labor force to assure that all aspects of the specifications are being fulfilled.
- B. Verify that all work and equipment is installed in accordance with manufacturer's warranty requirements.

PART 2 – PRODUCTS

2.1 GENERAL

- A. All gate and globe valves shall be designed for repacking under pressure when fully opened, and shall be equipped with packing suitable for the intended service. When the valve is fully opened, the back seat shall protect the packing and the stem threads from the fluid. All gate and globe valves shall have a gland follower. The pressure- temperature rating of valves shall be not less than the design criteria applicable to all components of the system.
- B. Insofar as possible, all valves of the same type shall be of the same manufacture.
- C. Valves installed above 7 ft. in Mechanical Rooms shall have chain operators.
- D. All valves shall be provided with stem extensions. Valve handle shall be clear of insulation jacket.

E. Manufacturers:

Stockham
 Milwaukee
 Hammond
 Apollo
 Watts
 Walworth
 Nibco
 Jamesbury

2.2 CHILLED WATER SYSTEMS

A. Gate Valves - 2" and smaller:

Valves 2" and smaller shall be of Class 125, body and bonnet shall be of ASTM-B-62 cast bronze composition, threaded or solder ends, solid disc, copper-silicon alloy stem, brass packing gland, Teflon- impregnated packing and malleable handwheel.

Recommended Valves:

Threaded:			Solder:		
Stockham B-100 (RS)			Stockham B-108 (RS)		
or			or		
Stockham B-103 (NRS)			Stockham B-104 (NRS)		
	RS	NRS		RS	NRS
Hammond	IB690	IB609	Nibco	S111	S113
Milwaukee	148	105	Hammond	IB691	IB613

B. Gate Valves - 2-1/2" and Larger:

Valves 2-1/2" and larger shall be Class 125 iron body, bronze mounted, with body and bonnet conforming to ASTM A-126 Class B cast iron, flanged ends with Teflon-impregnated packing and two-piece packing gland assembly.

Recommended valves:

Stockham G-623 OS&Y RS		
Stockham G-612 NRS		
	OS&Y	NRS
Hammond	IR1140	---
Nibco	F617-0	F639-31

C. Ball Valves - 2" and Smaller:

Valves 2" and smaller shall be 600 psi CWP, have cast brass bodies, replaceable reinforced Teflon seats, conventional port, blowout proof stems, chrome plated brass ball, and threaded or solder ends. Provide extended valve handle to accommodate up to 2" of insulation with non-thermal conductive material, insulation plug, cap and protective sleeve.

Recommended valves:

Threaded:	Solder:
Stockham S-216-BR-RT	Stockham S-216-BR-RS
NIBCO T-580-70BR	NIBCO S-580-70BR-R
Jamesbury II 1100TT	----
Apollo 70-100	Apollo 70-200
Inline 334	----

Alternative is Stockham S-217-BR-RT (threaded).

Drain valves, ½" or ¾" shall be 600 psi CWP, with stainless steel trim, cast bronze body, 2-piece with cap and chain, full port stainless steel ball and stem, RTFE ball seat, threaded or soldered inlet connection, cap rated for 150 psi.

Recommended valve:

Stockham S-285-BR-R-66-HC.

D. Globe Valves - 2" and Smaller:

Valves 2" and smaller shall be of Class 125, body and bonnet of ASTM B-62 cast bronze composition, threaded or soldered ends, copper silicon alloy stem, brass packing gland, Teflon-impregnated packing, and malleable handwheel.

Recommended valves:

Threaded:	Solder:
Stockham B-13T (Teflon Disc)	Stockham B-14T (Teflon Disc)
Stockham B-16 (Bronze Disc)	Stockham B-17 (Bronze Disc)
Nibco T211B Hammond IB440	Jenkins 1200 Nibco S211Y

E. Globe Valves - 2-1/2" and Larger:

Valves 2-1/2" and larger shall be Class 125 iron body, bronze mounted with body and bonnet conforming to ASTM A-126 Class B cast iron, flanged ends, with Teflon-impregnated packing and two-piece packing gland assembly.

Recommended valves:

Stockham G-512 (Bronze disc)
Stockham G-514T (Teflon disc)

Bronze Disc:	Comp. Disc.:
Hammond IR116	---
Nibco F718B	---

F. Check Valves - 2" and Smaller:

Valves 2" and smaller shall be of Class 125, threaded or solder ends, body and caps shall be ASTM B-62 cast bronze composition, swing type disc.

Recommended valves:

Threaded:	Solder:
Stockham B-319	Stockham B-309
Hammond IB490	IB941
Milwaukee 509	1509

If composition disc is preferred, specify Stockham B-320B - threaded end, or B-310B - solder end, for Class 125 service.

G. Check Valves - 2-1/2 and Larger:

Valves 2-1/2" and larger shall be iron body, bronze mounted with body and cap conforming to ASTM A-126 Class B cast iron, flanged ends, swing type disc.

Recommended valves:

Stockham G-931

Hammond IR1124
Milwaukee F2974

2.3 HOT WATER HEATING SYSTEM

A. Gate Valves - 2" and smaller:

Valves 2" and smaller shall be of Class 150 with body and union bonnet of ASTM B-62 cast bronze composition, threaded or solder ends, solid disc, copper-silicon stem, brass packing gland, Teflon- impregnated packing, and malleable handwheel.

Recommended valves:

Threaded:	Solder:
Stockham B-120 (RS)	Stockham B-124
Stockham B-130 (RS)	----
Hammond IB629	IB648
Nibco T134	S134

B. Ball Valves - 3" and smaller:

Valves 3" and smaller shall be 600 psi CWP, have cast brass bodies, replaceable reinforced Teflon seats, conventional port, blowout proof stems, chrome plated brass ball, and threaded or solder ends with extended solder cups.

Recommended valves:

Threaded:	Solder:
Stockham S-216-BR-RT	Stockham S-216-BR-RS
Worcester 4112 RT	---
Jamesbury II 1100TT	----
Apollo 70-100	Apollo 70-200
Nibco T580-70BR	S580-70BR-R
Inline 334	----

Drain valves, ½" or ¾", shall be 600 psi CWP, with stainless steel trim, cast bronze body, 2-piece with cap and chain, full port stainless steel ball and stem, RTFE ball seat, threaded or soldered inlet connection, cap rated for 150 psi.

Recommended valve:

Stockham S-285-BR-R-66-HC

C. Globe Valves - 2" and smaller:

Valves 2" and smaller shall be of Class 150 with body and union bonnet of ASTM B-62 bronze, copper-silicon alloy stem, brass packing gland, Teflon-impregnated packing and malleable handwheel.

Recommended valves:

Threaded:	Solder:
Stockham B-22 (Teflon Disc)	Stockham B-24 (Teflon Disc)
Stockham B-29 (Stainless trim)	----
Comp. Disc.:	S.S. Trim:
Nibco T-235-Y	Milwaukee 591A

D. Check Valves - 2" and smaller:

Valves 2" and smaller shall be Class 150 with bodies and caps of ASTM B-62 bronze composition and threaded ends. Class 150 valves shall have lift-type Buna-N-disc and union caps, and are to be used in lines with globe valves.

Recommended valves:

Stockham B-322-B
Hammond IB948
Milwaukee 510

For backflow prevention in lines with gate valves, Y-pattern valves with swing-type disc are recommended.

For Class 150 Service, threaded ends:

Stockham B-321

2.4 REFRIGERANT VALVES & SPECIALTIES

A. Service Valves:

1. Globe Shutoff Valves: Forged brass, packed, back seating, winged seal cap, 300 degrees F (149 degrees C) temperature rating, 500 psi working pressure.
2. Check Valves: Forged brass, accessible internal parts, soft synthetic seat, fully guided brass piston and stainless steel spring, 250 degrees F (121 degrees C) temperature rating, 500 psi working pressure.
3. Manufacturers:

Henry Valve Co.
Parker Hannifin Corp., Refrigeration & Air-Conditioning
Sporlan Valve Co.

B. Specialties:

1. Refrigerant Strainers: Brass shell and end connections, brazed joints, monel screen, 100 mesh, UL listed, 350 psi working pressure.
2. Moisture-Liquid Indicators: Forged brass, single port, removable cap, polished optical glass, solder connections, UL listed, 200 degrees F (93 degrees C) temperature rating, 500 psi working pressure.
3. Refrigerant Filter-Driers: Steel shell, ceramic fired desiccant core, solder connections, UL listed, 500 psi working pressure.

4. Manufacturers:

Alco Controls Div., Emerson Electric Co.
Henry Valve Co.
Parker-Hannifin corp., Refrigeration & Air Conditioning Div.
Sporlan Valve Co.

PART 3 – EXECUTION

3.1 PIPING SYSTEMS

- A. All piping to drain to low points. Low points shall be provided with drain valves with hose thread.
- B. Valve body construction shall match piping system material.
- C. Install isolating fittings between sections of ferrous and non-ferrous pipe or connected equipment.
- D. Valves shall be installed with stems above horizontal.
- E. Valves shall be installed on all sides of equipment and control valves to allow isolation for repair.
- F. Unions shall be provided adjacent to all valves, at equipment connections, and where necessary to facilitate dismantling of the piping system.

3.2 TAGS, CHARTS AND IDENTIFICATION

- A. Identify each valve in all systems in accordance with requirements of Section 230210.

END OF SECTION 23 02 15

SECTION 23 02 30

INSULATION & COVERING – HVAC

PART 1 – GENERAL

1.1 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 Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

1.2 DESCRIPTION OF WORK

- A. This Section includes insulation and covering provided on the following piping and equipment:
 - 1. Hot Water Heating Piping
 - 2. Chilled Water Piping
 - 3. Condensate Drain Lines
 - 4. Refrigerant Piping.
 - 5. Cold Equipment Surface
 - 6. Exterior Piping
 - 7. Acoustic Duct Liner
 - 8. Reusable Valve Covers
 - 9. Insulated Pipe Saddles
- B. Insulation shall be installed on the following duct systems:
 - 1. All supply ductwork.
 - 2. All return ductwork.

1.3 REFERENCE STANDARDS

- A. Refer to Section 230200 for a general description of requirements applying to this section.

1.4 QUALITY ASSURANCE

- A. Refer to Section 230210 for a general description of requirements applying to this section.
- B. Install insulation in accordance with manufacturer's recommendations.
- C. Provide adequate supervision of labor force to assure that all aspects of the specifications are being fulfilled.

1.5 SUBMITTALS

- A. Submit shop drawings, installation instructions, and manufacturer's literature of all materials specified in accordance with Section 230200.
- B. Submit fabrication instructions for pipe fitting and valve insulation.
- C. Submit manufacturer's joining recommendations for butt joints and longitudinal seams.

1.6 WARRANTY/GUARANTEEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements.

PART 2 – PRODUCTS

2.1 PIPE INSULATION MATERIAL

- A. Fiberglass:
 - 1. Material: Preformed fiberglass bonded with resin to form circular pipe sleeves with factory applied, white all service jacket bonded to reinforced foil vapor barrier jacketing. The jacket shall have factory applied double pressure-sensitive, self-sealing adhesive closure and vapor sealing of longitudinal joints. Thermal conductivity: 0.24 Btu/Hr./SF/inch at 100 degrees F. Flame spread of 25 and developed smoke of 50 or less.
 - 2. All Valves and Fittings:
 - a. Glass fiber insert and premolded PVC cover, Johns Manville Corp. "Zeston" and "Hi-Lo Temp Inserts" for fittings. Glass fiber must fill the entire space within the cover completely.
 - b. Factory molded fibrous glass fitting covering for fittings. Coat ends with Fosters 30-36 lagfast adhesive
 - c. Mitered sections of pipe covering for valves.
 - 3. Manufacturers: Johns Manville Corp., Certain -Teed, Owens - Corning, Knauf.
- B. Closed Cell:
 - 1. Material: Black flexible elastomeric foamed closed cell structure insulation 25/50 rated with a flame spread rating of 25 or less and a smoke developed rating of 50 or less with both a moisture seal and a reinforced elastic foam lap seal closure system.
 - 2. Flexible pipe insulation shall be a foamed plastic closed cell structure material, with a thermal conductivity of not more than 0.27 Btu/Hr./Sq. Ft./Inch at a mean temperature of 75°F. The insulation shall have an average density of at least 2 pounds per cubic foot, shall be self-extinguishing, and shall have a water vapor transmission rating of not more than 0.1

perms. Between temperature limits of -40°F and plus 220°F, the insulation shall not indicate any deviation from its original state.

3. Specification Compliance:

ASTM-E-84
ASTM-C-534 Type I – Tubular, Type II – Sheet.
ASTM-D-1056, 2B1 – Tubular, Sheet.
MIL-C-3133B (MIL STD 670B) Grade SBE-3
MIL-P-15280J, Form T, Form S.

4. Manufacturers: Armacell, Nomaco K-Flex, Halstead.

C. Covering of Pipe Insulation Outdoors:

1. Wrapping: Wrap insulation with embossed 0.016" aluminum jacket.
2. Fastenings: Cover shall be held in place with soft aluminum bands on 12" centers.
3. Valves and Fittings: Weatherproof all valves and fittings.

D. Manufacturers: Johns Manville Corp., Certain-Teed, Owens- Corning, Knauf.

2.2 DUCT INSULATION

A. Concealed Supply & Return Ductwork: Fiberglass duct wrap bonded with resins, 3/4 pound density, aluminum foil facing reinforced with fiberglass scrim, laminated to Kraft, 2" thick.

1. Thermal Conductivity: 0.27 Btu/Hr./SF/Inch at 75°F. Min. installed "R" value w/25% compression shall be 5.6.
2. Duct wrap shall be cut to stretch-out dimensions as provided in manufacturer's instructions. Remove a 2" piece of insulation from the facing at the end of the piece of insulation to form an overlapping staple and tape flap. Install with facing outside so tape flap overlaps insulation and facing at other end. Insulation shall be tightly butted and not compressed excessively at duct corners. Seams shall be stapled 6" on center with outward clinching staples. All seams, tears, punctures and other penetrations of the insulation facing shall be sealed with foil tape or vapor proof mastic. Where rectangular ducts are 24" in width or greater, duct wrap shall be secured to the bottom of the duct with mechanical fasteners; i.e., stick pins spaced 18" on center.

B. Exposed supply & return air ductwork shall be insulated in finished conditioned spaces, penthouse, mechanical rooms, mezzanine areas, equipment closets, and non-conditioned spaces with 2" thick rigid fiberglass board. Insulation shall be 6 P.C.F. density with a "K" value of 0.25 Btu/Hr./SF/Inch at 75 degrees F. mean temperature and shall be U.L. listed at 25 maximum for flame spread, and 50 maximum for smoke developed. Insulation shall be applied using Graham Pins or Stik-Clips and all seams, edges and breaks shall be sealed with 4" matching tape and sealed with Vicryl CP-10 to match ASJ jacket. Insulation shall be provided with all-service jacket facing.

C. Manufacturers: Johns Manville Corp., Certain-Teed or Owens- Corning, Knauf.

D. Outdoor Installation:

1. Two inch (2") thick Arma Tuff supplied in sheet and roll forms laminated with a white, 0.012" thick thermoplastic rubber membrane.
2. Material shall be resistant to ozone and ultraviolet radiation with a of 10 year limited warranty against breakdown of the membrane.
3. Thermal conductivity shall be 0.25 at 75°F mean temperature with a vapor permeability of 0.05 perm-inch for the foam and 0.00 for the laminate.
4. Insulation shall be applied using Armaflex 520 adhesive; seams shall be covered with minimum 6 inch wide self-sealing tape and minimum 6 inch wide self-sealing tape along all exposed edges. Install per manufacturer's instructions.
5. Covering of Insulation Outdoors: Minimum insulation value shall be R-8.

2.3 ACOUSTIC DUCT LINER

- A. Duct liner shall be designed for use as an acoustical insulation to absorb air conditioning noise in sheet metal ducts and plenums operating at velocities up to 6000 fpm and temperatures up to 250 deg. F.
- B. Duct liner shall be a bonded mat of glass fibers coated with an EPA registered biocide and a black pigmented fire-resistant coating on the air stream side.
- C. Duct liner shall comply with the requirements of NFPA 90A and 90B. Surface burning characteristics shall comply with UL Standard 723 for 25/50 flame and smoke development.
- D. Duct liner shall comply with the property requirements of ASTM Specification C1071 Type 1. Material shall resist fungal and bacterial growth when subjected to ASTM G21 and G22 test methods.
- E. Material thickness, name of manufacturer and type shall be printed on the air stream side of the liner for ease of identification.
- F. Duct liner shall be 2" thick, unless otherwise noted on the drawings.
- F. Manufacturers: Owens Corning QuietR® AcousticR™ Duct Liner, Certainteed, Evonik Industries Solcoustic, Johns Manville Linacoustic® RC.

2.4 REUSABLE VALVE COVERS

- A. All valves, strainers, combination valves, etc. in chilled water and heating hot water systems shall be insulated with a factory fabricated removable and reusable cover.
- B. Insulation shall be either fiberglass blanket or flexible elastomeric thermal insulation as listed in Paragraph 3.2 of this specification. Flame and smoke spread shall be 25/50 per ASTM 84.

- C. Outer jacket shall be made of material equal to Tychem QC, overlap and completely cover the insulation, with seams joined by tabs made from Velcro or fabric straps per manufacturer's standards.
- D. Outer jacket shall overlap adjoining sections of pipe insulation, and shall be non-combustible, impermeable to water, and prevent mold, mildew and condensation.
- E. Installation shall not require the use of any special hand tools.
- F. Manufacturers: Corick Valve Covers, NoSweat Valve Wraps.

2.5 INSULATED PIPE SADDLES

- A. Insulation and facing shall each meet 25/50 flame and smoke ratings per ASTM E-84 on a component basis.
- B. A section of rigid insulation shall be used at all cold pipe hangers or support locations and shall consist of:
 - 1. A rigid 2.5 PCF phenolic foam pipe insulation designed to support pipe sizes up to and including 8" iron pipe size.
 - 2. A rigid 5 PCF phenolic foam pipe insulation designed to support pipe sizes from 5" to 30" iron pipe size.
 - 3. For all hot pipe hanger or support locations, the insert material shall be either rigid calcium silicate per ASTM C303 or perlite silicate per ASTM C303 with all service jacket and laminated to a steel support saddle.
- C. The insulation jacket shall contain a vapor retarding material to provide low moisture vapor permeability and resistance to mold, mildew and fungus growth.
- D. The insulation shall be free of any CFC or HCFC materials.
- E. The insulation shall have a minimum K-factor of 0.13 at 75 deg. F mean temperature, and self-sealing lap joint with high performance acrylic pressure sensitive adhesive tape.
- F. Integral insulation saddle shall be made of G-90 carbon steel, with full 180 deg. Coverage, flared edges to protect the vapor barrier jacket and insulation, and short rib surface to center the saddle inside the hanger and prevent movement.
- G. Preformed insulation shall extend beyond the saddle by a minimum of 1-1/2" to accommodate a tape joint seal at the butt edges of adjoining insulation sections.

H. Minimum product dimensions shall be as follows:

Nominal pipe size (inches)	Insulation density (PCF)	Insulation length (inches)	Saddle length (inches)	Saddle gauge
½ - 3½	3.75	9	6	20
4 – 8	3.75	12	9	18

I. Manufacturer: Tru-Balance insulated saddles as made by Buckaroos, Inc.

PART 3 – EXECUTION

3.1 INSTALLATION - GENERAL

- A. Do not install until systems have been tested and meet requirements.
- B. Heavy work which may damage insulation shall have been completed in the vicinity of the insulation work.
- C. Provide non-compressible insulation saddles at all piping hanger locations, and at all piping hanger locations where piping is insulated with flexible closed cell insulation.

Option: Provide insulation coupling system as made by Klo-Shure Co.
- D. All installations shall be made by skilled craftsmen regularly engaged in this type of work.
- E. Insulation shall be continuous thru-wall, ceiling and floors.
- F. Metal shields, 16 gauge galvanized, shall be installed between hangers and pipe insulation.
- G. Pipe, ductwork and equipment shall be clean and dry prior to insulating.
- H. Install all insulation per manufacturer's instructions.
- I. To avoid undue compression of insulation, provide solid core inserts at all supports as recommended by the insulation manufacturer. Provide insulation shields between the insulation jacket and the hanger.
- K. Ductwork treated with internal acoustic duct liner does not require external insulation, within interior installations. Exterior exposed ductwork shall be insulated per article 2.2.D.
- L. Apply vapor proof mastic as recommended by the insulation manufacturer on all longitudinal and butt joints of sectional pipe insulation. Apply similar mastic to the end of every third length of sectional pipe insulation on all chilled water pipe insulation to prevent the migration of condensation that might occur.

3.2 PIPE INSULATION - TYPES & THICKNESSES

- A. Provide fiberglass insulation of thickness specified on:

1. Heating Hot Water: (Up to 200°F)

1½" for piping 1½" and below
2" for pipes 2" and over.

2. Chilled Water:

1½" for piping 2" and over.

3. Refrigerant Piping: Interior locations, exposed and concealed for suction lines. (NOTE: Insulate liquid line if metering device is mounted at the condensing unit.)

1½" thick.

4. Freeze protection of outdoor piping (over heat tracing tape): 3" thick insulation, with metal jacket.

- a. HVAC: Chilled water piping designated on the drawings.
- b. Equipment drain piping.

B. Provide flexible closed cell insulation of thickness specified on:

1. Refrigerant Piping: Exterior Locations for suction lines. (NOTE: Insulate liquid line if metering device is mounted at the condensing unit.)

1" thick for piping 1½" and less.
1½" thick for piping 2" and over.

2. Cold surfaces of refrigeration equipment, air separators for chilled water, and chilled water pumps. ¾" thickness

3. Chilled water expansion tanks. ¾" thickness

4. 1" thickness for all water piping within terminal unit cabinets.
1" thickness for chilled water piping 1½" and below.

5. ½" thickness for condensate drain lines.

3.3 PIPE COVERING (FOAMED PLASTIC TYPE)

A. All joints and seams shall be sealed with a compatible adhesive. Approved adhesives are as follows:

Armstrong World Industries No. 520
Benjamin Foster Company No. 85-75 up to 200 degrees F.

Contractor may use Armstrong Self-Seal Armaflex 2000 insulation in lieu of the above wherever 1/2" is specified.

- B. Fitting covers shall be fabricated from the foamed plastic pipe insulation or from sheet insulation of the identical material. The fabrication shall be in accordance with manufacturer's instructions, and all seams mitered joints shall be joined using the adhesives described hereinbefore.
- C. Pipe insulation in concealed spaces shall require no finish coatings.
- D. Pipe insulation in all other areas shall receive two coats of finish of color selected by Architect. Approved finishes are as follows:

Armstrong World Industries WB Armaflex Finish

3.4 EXTERIOR PIPE COVERING

- A. Wrapping: Wrap insulation with embossed 0.016" aluminum jacket, orient seam down.
- B. Fastenings: Cover shall be held in place with soft aluminum bands on 12" centers.
- C. Valves and Fittings:
 - 1. Weatherproof all valves and fittings.
 - 2. Finish: Apply two coats of vapor resistant mastic reinforced with glass fabric over wrapping.

3.5 INTERIOR PIPE COVERING

- A. Provide premolded PVC cover on all interior insulated piping exposed in finished spaces. Orient seams up in overhead piping and toward the wall in vertical runs.
- B. Provide factory molded fitting covering for fittings and accessories, sealed and held in place by manufacturer's recommended sealing system.
- C. Provide mitered sections of covering for valves.

3.6 ACOUSTIC DUCT LINER

- A. All portions of duct designated on the drawings to receive duct liner shall be completely covered with duct liner, adhered to the sheet metal with a 100% coverage of adhesive complying with ASTM C916.
- B. Transverse joints shall be neatly butted and there shall be no interruptions or gaps. All transverse joints and all exposed leading edges shall be coated. The black coated surface of the duct liner shall face the airstream.
- C. Duct liner shall be secured with mechanical fasteners which shall compress the duct liner sufficiently to hold it firmly in place.
- D. Duct liner shall be cut to assure overlapped and compressed longitudinal joints.

- E. After installation is complete, blow out the duct system prior to operation to remove any cutting scraps and foreign material remaining in the duct.

3.7 INSULATED PIPE SADDLES

- A. Insulated pipe saddles shall be installed at all hangers, rollers or supports in accordance with manufacturer's written instructions.
- B. All piping shall be clean and free of oil, rust and moisture prior to and during support installation.
- C. All insulated saddles and accessories shall be stored in a dry area protected from weather before and during installation
- D. Seal adjoining butt edges of pipe insulation with approved mastic and tape to insure continuity of the insulation jacket and vapor barrier, especially on cold piping system installations.

END OF SECTION 23 02 30

SECTION 23 03 00

VIBRATION AND SOUND ISOLATION – HVAC

PART 1 – GENERAL

1.1 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 Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

1.2 DESCRIPTION OF WORK

- A. This Section includes providing the following vibration and sound isolation material on items furnished and installed under HVAC work:
 - 1. Pump-mounted inertia pads
 - 2. Piping
 - 3. Rooftop AHU's
 - 4. Ductwork and equipment

1.3 REFERENCE STANDARDS

- A. Refer to Section 230200 for a general description of requirements applying to this section.

1.4 QUALITY ASSURANCE

- A. Refer to Section 230210 for a general description of requirements applying to this section.

1.5 SUBMITTALS

- A. Submit shop drawings, installation instructions, and manufacturer's literature of all materials specified in accordance with Section 230200.
- B. Submit the following:
 - 1. Shop drawings
 - 2. Product data

1.6 WARRANTY/GUARANTEES

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements.

PART 2 – PRODUCTS

2.1 GENERAL

- A. All vibration control apparatus shall be furnished by a single recognized manufacturer. The manufacturer shall submit to the Architect/Engineer evidence affirming that he has been a supplier of vibration control devices of the type required for the past five years.
- B. The vibration control apparatus manufacturer shall supervise, inspect, measure, and approve the installation and shall submit a report to the Architect/Engineer substantiating that all the equipment has been adequately isolated.
- C. Any requests for changes in the specifications must be submitted in writing in time for review and approval through a written addendum to the specifications prior to bid closing.
- D. Unless otherwise indicated or specified, all equipment mounted on vibration isolator bases shall have a minimum operating clearance of 1 inch between the base and the floor or housekeeping and beneath. Clearance space shall be checked to insure that no scrap, rubbish, hardware, etc., has been left to possibly short circuit isolated base.
- E. In connecting isolated HVAC equipment to rest of system, care must be exercised to insure proper installation.
 - 1. Equipment connected to water piping shall be erected on isolators or isolated foundations to correct operating height prior to making piping connections to avoid misalignment problems. To facilitate this, equipment shall be blocked-up with temporary shims to final operating height. When full load is assembled and water is in system, isolators shall then be adjusted to take up load just enough to allow removal of shims.
 - 2. Air handling equipment such as centrifugal fans shall be erected on isolators and leveled with fan operating before flexible duct connection is made. Insure that duct position is in proper alignment and providing proper clearance in proportion to flexible duct connector length. When fan is shut off, misalignment with ductwork is allowable providing it does not strain or damage flexible duct connector. In cases of high static pressure, fans requiring position stabilizers are to be adjusted when fan is operating to achieve the results as described above with isolator adjustment.
- F. Vibration isolator sizes and location shall be determined by the vibration control products manufacturer or as specified herein.
- G. Model numbers of Amber/Booth Co., are given for identification. Products of specified manufacturers will be acceptable, provided they comply with all of the requirements of this specification.

2.2 ISOLATOR TYPES

- A. Pump Mounted Inertia Pads:

1. Frame to be structural steel with built-in height saving bracket for recessing into a CPF concrete inertia block for side access.
2. Spring to be adjustable, free-standing, open-spring mounting with combination leveling bolt and equipment fastening bolt. The spring shall be rigidly attached to the spring mounting baseplate and compression plate. The isolator shall be designed for a minimum K_x/K_y (Horizontal-to-Vertical spring rate) of 1.0. A neoprene pad having a minimum thickness of 1/4" shall be bonded to the baseplate. Amber/Booth Type CPF with RSW-1.

B. Piping in Mechanical Room:

1. Type PBSR: for first two hangers in horizontal piping adjacent to isolated equipment and for all hangers on 8" and larger pipe, except the first two hanger points adjacent to riser shall be Type BS.
2. Type BSR for remaining hangers in horizontal piping.
3. Type SW for pipe risers. Isolator base plates shall be provided with holes for bolting and isolation grommets.
4. Type SW for floor supports except Type CT for first floor support adjacent to equipment isolated on CT isolators.

C. Rooftop AHU's:

1. Type RTIR: Provide an extruded aluminum rail base for rooftop air conditioning units consisting of a pair of weatherproofed aluminum rails for fastening to equipment and to roof curb incorporating wind restraints and a continuous air and water seal which is protected from accidental puncture and direct sunlight by an aluminum weather shield. Rails shall incorporate non-adjustable Type SW spring isolators properly spaced around perimeter and sized for 1" deflection. To prevent leaks, rails shall be factory assembled (to the limits of freight carriers) and shipped as a one-piece unit.

D. Ductwork and Equipment Lagging:

1. The barrier shall be constructed of 0.10" thick barium sulphate loaded limp vinyl sheet bonded to a thin layer of reinforced aluminum foil on one side.
2. The barrier shall have a nominal density of 1 psf and shall have a minimum STC rating of 28.
3. The barrier shall exhibit minimum flammability ratings of 0.0 seconds for flame out and afterglow and 0.2 inches for char length when tested in accordance with Federal Test Standard No. 191-5903.
4. The barrier shall have a minimum thermal conductivity "K" value of 0.29 and a rated service temperature range of 40°F to 220°F. When tested for Surface Burning Characteristics per ASTM E84, the barrier will have a flame spread index of no more than 10 and a smoke development index of no more than 40.

5. The decoupling layer shall be a combination of 2" fiberglass batting, non-woven porous scrim-coated glass cloth, quilted together in a matrix of 4" diamond stitch pattern which encapsulates the glass fibers. The barrier shall be Type KNM-100-ALQ-2 and the decoupling layer shall be type KFA by Kinetics. The composite material shall be fabricated to include a nominal 6" wide barrier overlap tab extending beyond the quilted fiberglass to facilitate a leak-tight seal around field joints. Nominal barrier width 54", nominal decoupler width 48".
6. Sound Transmission Loss: Tested as a free hanging barrier (ASTM E-90-90)

Frequency, Hz							
Product	125	250	500	1000	2000	4000	STC
KNM 100ALQ-2	11	16	26	35	44	49	28

- H. Manufacturers: Amber/Booth, Kinetics Noise Control, Mason Industries, Vibration Mounting & Controls, Vibration Eliminator, Inc.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's specifications and instructions.
 1. No metal-to-metal contact will be permitted between fixed and floating parts.
 2. Connections to Equipment: Allow for deflections equal to or greater than equipment deflections. Electrical, drain, piping connections, and other items made to rotating or reciprocating equipment (pumps, compressors, etc.) which rests on vibration isolators, shall be isolated from building structure for first three hangers or supports.
 3. Common Foundation: Mount each electric motor on same foundation as driven machine. Hold driving motor and driven machine in positive rigid alignment with provision for adjusting motor alignment and belt tension. Bases shall be level throughout length and width. Provide shims to facilitate pipe connections, leveling and bolting.
 4. Extend bases for pipe elbow supports at discharge and suction connections at pumps. Pipe elbow supports shall not short circuit pump vibration to structure.
 5. Ensure that the outer surface of the equipment or duct is clean and free of dust, dirt or similar foreign matter. If desired, the outside surface can be painted with a rust-resistant paint in order to minimize potential corrosion.
 - a. Field cut and apply the insulation decoupler to the outside of the duct. Obtain a uniform thickness by butting all seams together (do not overlap). At elbows or similar transitions, field measure and miter cut the insulation to fit. Ensure that the insulation is not compressed by the fastener used, if any.
 - b. Wrap the noise barrier around the equipment housing or insulation-wrapped duct. At all seams, overlap the barrier by a minimum of 2" and adhere using adhesive. Alternately,

the barrier can be butted together at joints with the seam covered by a 2" (50 mm) wide cut piece of the barrier material. This strip is then adhered to the barrier on either side of the seam using adhesive.

- c. If desired, metal or nylon bands can be wrapped around the outside of the barrier to guard against the potential of adhesive failure. If used, this banding should be placed on either side of all radial seams in addition to the midpoint on longer sections. Ensure that the banding is snug only and does not result in compression of the insulation decoupler beneath.
 - d. In lieu of banding, insulation "stick pins" can be used to reinforce the seams in the noise barrier. Ensure that the pin does not compress the insulation or barrier material beneath.
- B. Inspection and Adjustments: Check for vibration and noise transmission through connections, piping, ductwork, foundations, and walls. Adjust, repair or replace isolators as required to reduce vibration and noise transmissions to specified levels.

END OF SECTION 23 03 00

SECTION 23 04 50

REFRIGERATION EQUIPMENT – HVAC

PART 1 – GENERAL

1.1 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 Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

1.2 DESCRIPTION OF WORK

- A. This Section includes labor, material, equipment and supervision to for the following:
 - 1. Air-Cooled Water Chiller
 - 2. Ductless Split System Cooling Unit
 - 3. Ductless Split System Heat Pump Units
- B. Provide complete refrigeration system including chiller, aboveground piping and all required accessories.

1.3 REFERENCE STANDARDS

- A. Refer to Section 230200 for a general description of requirements applying to this section.
- B. Comply with applicable provisions of:
 - 1. International Mechanical Code
 - 2. ASME Codes for Pressure Vessels
 - 3. A.R.I. Capacity Ratings
 - 4. NFPA Pamphlets
 - 5. ASHRAE Standard 15
 - 6. ASHRAE Standard 90.1, Section 6, Table 6.8.1A thru J, minimum equipment efficiency.

1.4 QUALITY ASSURANCE

- A. Refer to Section 230210 for a general description of requirements applying to this Section.
- B. Whenever a variable frequency PWM drive is installed to control an AC motor, a maintenance-free, circumferential, conductive micro fiber shaft grounding ring shall be installed on the AC motor drive end to discharge shaft currents to ground. Recommended part: AEGIS SGR™ Bearing Protection Ring, as made by Electro Static Technology. Install in accordance with the manufacturer's written instructions.

1.5 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 230200.
- B. Submit the following:
 - 1. Shop drawings and product data for all equipment in this section.

1.6 SUBSTITUTIONS

- A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, this Contractor shall be responsible for any and all additional costs associated with the changes required by other trades.

1.7 WARRANTY/GUARANTEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements. In addition, the following special guarantee applies:
 - 1. Manufacturer shall guarantee all refrigeration equipment including parts and labor, for five (5) years from start-up.

PART 2 – PRODUCTS

2.1 AIR-COOLED WATER CHILLER

- A. The contractor shall provide air-cooled water chiller as shown and as scheduled on the contract documents. The chiller shall be installed in accordance with this specification and perform at the specified conditions as scheduled.
- B. General Unit Description: Provide factory assembled and tested outdoor air-cooled liquid chillers consisting of scroll compressors, condenser, evaporator, thermal or electronic expansion valve, refrigeration accessories, starter and control panel. Construction and performance ratings shall be in accordance with ANSI/ARI 550 or ANSI/ARI 590. Sound power levels shall be rated in accordance with ARI Standard 370.
- C. Compressors:
 - 1. Construct semi-hermetic scroll compressors with heat treated forged steel shafts, rings to prevent gas leakage, discharge valves, and sealing surface immersed in oil.
 - 2. Statically and dynamically balance rotating parts.

3. Provide oil lubrication system with either a sealed oil system or an oil charging valve and oil filter to ensure adequate lubrication during starting, stopping, and normal operation. Factory installed crankcase heater, pump, sightglass.
4. Provide compressor with automatic capacity reduction equipment. Compressor must start unloaded for soft start on motors.
5. Provide constant speed compressor motor, suction gas cooled with solid state sensor and electronic winding overheating protection, designed for across-the-line or star delta starting. Furnish with starter. Compressor motor power factor shall be 0.80 or greater. If the compressor motor power factor is less than 0.80, power factor correction capacitors must be installed.
6. Provide crankcase heater to evaporate refrigerant returning to crankcase during shut down. Energize heater when compressor is not operating.
7. Acoustic package shall be either factory or field installed to enclose the compressor section to reduce radiated sound by a minimum of 5 dBA.

D. Evaporator:

1. Provide single pass, ANSI Type 316 stainless steel brazed plate design or shell and tube type evaporator, seamless or welded steel construction with cast iron or fabricated steel heads, seamless internally finned copper tubes, roller expanded into tube sheets.
2. Design, test, and stamp refrigerant side working pressure and water side working pressure, in accordance with ANSI/ASME Code at:

Heat Exchanger	Evaporator
Brazed Plate	
Refrigerant Side	430 psig
Water Side	300 psig
Shell-N-Tube	
Refrigerant Side	235 psig
Water Side	150 psig

3. Insulate with 3 inch minimum thick flexible elastomeric rubber closed cell insulation with maximum K value of 0.26. Provide heat tape to protect evaporator to -20 degrees F
4. Provide water drain connection, vent and fittings for factory installed leaving water temperature control and low temperature cutout sensors.
5. Water connections shall be screwed, flanged or mechanical grooved. Evaporator shall have only one entering and one leaving connection. If manufacturer provides 2 separate evaporators, contractor shall provide manifold and pressure gauges to ensure equal flow is provided to each evaporator.

6. A 20-mesh, serviceable wye-strainer and mechanical couplings shall be provided for field installation on evaporator inlet prior to startup.
7. Evaporator shall be provided with piping extension kit and mechanical couplings to extend liquid connection from evaporator to edge of unit. Thermal dispersion type flow switch shall be factory installed in the evaporator outlet pipe extension and wired to the unit control panel. Insulation and heat trace on piping shall be the responsibility of installing contractor.

E. Condenser and Fans:

1. Construct condenser coils of aluminum fins mechanically bonded to seamless copper tubing. Provide sub-cooling circuits. Air test under water as required for a design working pressure of 650 psig.
2. Provide factory mounted wire screens pF heavy gauge PVC or galvanized steel, to cover the evaporator, condenser and compressor sections.
3. Provide fan motors with permanently lubricated ball bearings and built-in thermal overload protection. High efficiency, direct drive, 6-pole, 3-phase, insulation class "F", current protected, totally enclosed air-over (TEAO), rigid mounted, with double sealed, permanently lubricated, ball bearings.
4. Provide factory mounted standard options to reduce condenser fan(s) sound levels by up to 4 dB with speed controls, blade pitch, and number of blades per fan for ultra-quiet fans. Fans shall be dynamically and statically balanced, direct drive, corrosion resistant glass fiber reinforced composite blades molded into a low noise, full-airfoil cross section, providing vertical air discharge and low sound. Each fan shall be provided in an individual compartment to prevent crossflow during fan cycling. Guards of heavy gauge, PVC coated or galvanized steel shall be factory installed.

F. Enclosures:

1. House components in 12 gauge galvanized steel frame and mounted on welded structural steel base. Hot-dip galvanized steel frame coating shall be Underwriters Laboratories Inc. (UL) recognized as G90-U, UL guide number DTHW2.
2. Unit panels, wire screens, and control panels shall be finished with a baked on powder paint. Control panel doors shall have door stays.
3. Mount starters and disconnects in weatherproof panel provided with full opening access doors. Provide lockable disconnect operating handle external to panel and clearly visible from outside of unit indicating if power is on or off.
4. Casings fabricated from steel that do not have a Zinc coating conforming to ASTM A 123 or ASTM A525 shall be treated for the prevention of corrosion with a factory coating or paint system. The coating or paint system shall withstand 500 hours in a salt-spray fog test in accordance with ASTM B 117. Each specimen shall have a standard scribe mark as defined in ASTM D 1654. Upon completion of exposure, the coating or paint system shall be evaluated and rated in accordance with procedures A and B of ASTM D 1654. The rating of

failure at the scribe mark shall be not less than six (average creepage not greater than 1/8 inch). The rating of the unscribed area shall not be less than ten (no failure). Thickness of coating or paint system on the actual equipment shall be identical to that on the test specimens with respect to materials, conditions of application, and dry-film thickness.

G. Refrigerant Circuit:

1. All units shall have refrigeration circuits, each with single or multiple compressors for operation.
2. Provide for each refrigerant circuit:
 - a. Liquid line shutoff valve.
 - b. Filter dryer (replaceable core type).
 - c. Liquid line sight glass and moisture indicator.
 - d. Electronic or thermal expansion valve sized for maximum operating pressure.
 - e. Charging valve.
 - f. Discharge and oil line check valves.
 - g. Compressor suction and discharge service valves.
 - h. High side pressure relief valve.
 - i. Full operating charge of refrigerant and oil.
 - j. Unit factory leak tested at 250 psig, low side; 438 psig, high side.
3. Capacity Modulation: Provide capacity modulation by staging compressors. Unit shall be capable of operation down to 15%.

H. Controls:

1. On chiller, mount weatherproof control panel, containing starters, power and control wiring, molded case disconnect switch UL approved with external lockable operator handle, factory wired with terminal block power connection. Provide single point power connection with primary and secondary fused control power transformer and a 115 volt single phase connection for evaporator heat tape and GFI service receptacle.
 - a. Disconnect switch shall be a fused disconnect.
2. For each compressor, provide across-the-line starter on 460V applications.
3. Provide the following safety controls with indicating lights or diagnostic readouts.
 - a. Low chilled water temperature protection.
 - b. High refrigerant pressure.
 - c. Low oil flow protection.
 - d. Loss of chilled water flow.
 - e. Contact for remote emergency shut-down.
 - f. Loss of refrigerant charge protection.
 - g. Motor current overload.
 - h. Phase reversal/unbalance/single phasing.
 - i. Over/under voltage.

- j. Failure of water temperature sensor used by controller.
 - k. Compressor status (on or off).
4. Provide the following operating controls:
- a. Multiple step leaving chilled water temperature controller which cycles compressors.
 - b. Five minute solid state anti-recycle timer to prevent compressor from short cycling. If a greater than 5 minute solid state anti recycle timer is provided, hot gas bypass shall be provided to insure accurate temperature control in light load applications.
 - c. Load limit thermostat to limit compressor loading on high return water temperature to prevent nuisance tripouts.
 - d. Low ambient controls for operation down to 25 degrees F.
 - e. High ambient unloader pressure stat that unloads compressors to keep head pressure under control and help prevent high pressure nuisance tripouts on days when outside ambient is above design.
 - f. Compressor current sensing unloader unit that unloads compressors to help prevent current overload nuisance tripouts
 - g. Auto lead-lag functions that constantly evens out running hours and compressor starts automatically. If contractor can not provide this function then cycle counter and hour meter shall be provided for each compressor so owner can be instructed by the contractor on how to manually change lead-lag on compressors and even out compressor starts and running hours.
 - h. Low ambient lockout control with adjustable setpoint.
 - i. Condenser fan sequencing which automatically cycles fans in response to ambient, condensing pressure and expansion valve pressure differential thereby optimizing unit efficiency.
 - j. 150 psi, NEMA-1 flow switch, differential pressure type design.
 - k. Inlet, return water strainer, line size.
5. Provide digital display of pressures on microprocessor.
6. Provide ammeters for each compressor or digital display of % RLA on microprocessor.
7. Control Power Transformer:
8. Startup: Factory authorized starting.

- I. Approved Manufacturers: York, Carrier, McQuay.
 1. Any listed equivalent manufacturer and the Mechanical Contractor shall be completely responsible to comply with all requirements on the contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades.

2.2 DUCTLESS SPLIT SYSTEM COOLING UNITS

- A. The units shall be designed to maintain temperature conditions within the Room. Systems shall be supplied with ETL and ARI listings.
- B. Design Requirements: The cooling unit shall be a Samsung factory assembled unit. It shall be specifically designed for exposed installation and serviceable from the front of the unit. Each unit shall be capable of automatically increasing fan speed to the air supply grille. The circulating air fan shall be three-speed for precise control.
- C. Standard Features:
 1. The cabinet and chassis shall be constructed of heavy gauge galvanized steel and designed for easy installation and service access from one side only.
 2. The air distribution system shall be constructed with a quiet, direct-drive fan assembly equipped with double-inlet blower, self-aligning sleeve bearings, and lifetime lubrication. Fan motor shall be permanent-split capacitor, high efficiency type, equipped with two speeds for air flow modulation. Dehumidification shall utilize the lower fan speed.
 3. The filters shall be washable and shall be removable without tools or shutting down the system.
 4. The control system shall be microprocessor based. The wall-mounted wired remote control enclosure shall include an LCD display providing a continuous display of operating status and condition. An keypad for setpoint/program control, unit ON/OFF, and fan speed shall be located below the display.
 - a. The auto restart feature shall automatically restart after a power failure.
 - b. The control shall have temperature control setpoint for cooling function with a minimum 2 deg. F differential. The temperature control setpoint range shall be 60 deg. F to 85 deg. F.
 - c. The LCD display shall provide an ON/OFF indication, fan speed indication, operating mode indication (cooling, dehumidifying) and current day, time, temperature and humidity (if applicable) indication.
- D. Direct Expansion System Components:
 1. The evaporative coil shall be constructed of copper tubes and aluminum fins. The coil shall be provided with a drain pan.

2. The refrigeration system shall consist of a hermetic compressor, pressure safety switches, externally equalized expansion valve, and a refrigerant sight glass and moisture indicator.
- E. Remote Air-Cooled Condenser: The condenser coil shall be constructed of copper tubes and aluminum fins, and a direct-drive centrifugal fan. No piping, brazing, dehydration or charging shall be required. Condenser electrical connection shall be by a factory wired plug. Fan shall be sized to provide full rated cooling capacity at 95 deg. F entering air. Provide wire guards on condenser coil and fan discharge.
- F. Manufacturers: Airdale, Carrier, Daikin, EMI, LG HVAC, McQuay, Mitsubishi Electric, Panasonic, Sanyo A.C. Products, Samsung.

2.3 DUCTLESS SPLIT SYSTEM HEAT PUMP UNIT

- A. Air conditioning system shall be a ductless split system heat pump. The system shall consist of a compact ceiling-mounted or wall-mounted packaged evaporator section and matching outdoor air-cooled condensing unit. The units shall be listed by and bear the ETL label. All wiring should be in accordance with the National Electrical Code (N.E.C.). The units shall be rated in accordance with ARI Standard 240 and bear the ARI label. A full charge of refrigerant for 100 feet of refrigerant tubing shall be provided in the condensing unit. A dry nitrogen holding charge shall be provided in the evaporator. System SEER shall meet or exceed current Federal Standards.
- B. The indoor unit shall be factory assembled and wired. The casing fascia shall have a white or gray finish. The evaporator fan shall be an assembly with line flow fans direct driven by a single motor. The supply fan motor shall be multi-speed, permanent-split capacitor type with thermal overload protection and sealed, lifetime bearing. The fan shall be backward curved, centrifugal design, statically and dynamically balanced and run on permanently lubricated bearings. An adjustable guide vane shall be provided with the ability to change the air flow from horizontal to vertical. A motorized air sweep flow louver shall provide an automatic change in air flow by directing the air from side to side for uniform air distribution. Return air shall be filtered by means of an easily removable washable filter.
- C. The evaporator coil shall be nonferrous construction with smooth plate fins bonded to copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phoscopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil.
- D. The unit shall be constructed from galvanized steel that is insulated internally and externally with fire-resistant acoustic insulation.
- E. The control system shall be microprocessor based. The wall-mounted remote control enclosure shall include an LCD display providing a continuous display of operating status and condition. An keypad for setpoint/program control, unit ON/OFF, and fan speed shall be located below the display.
 1. The auto restart feature shall automatically restart after a power failure.

2. The control shall have temperature control setpoint for cooling function with a minimum 2 deg. F differential. The temperature control setpoint range shall be 60 deg. F to 85 deg. F.
 3. The LCD display shall provide an ON/OFF indication, fan speed indication, operating mode indication (cooling, dehumidifying) and current day, time, temperature and humidity (if applicable) indication.
- F. Direct Expansion System Components:
1. The evaporative coil shall be constructed of copper tubes and aluminum fins. The coil shall be provided with a drain pan.
 2. The refrigeration system shall consist of a hermetic compressor, pressure safety switches, externally equalized expansion valve, and a refrigerant sight glass and moisture indicator.
 3. Low ambient control will allow cooling to 0 deg. F outdoor temperature.
- G. Remote Air-Cooled Condenser: The condenser coil shall be constructed of copper tubes and aluminum fins, and a direct-drive centrifugal fan. No piping, brazing, dehydration or charging shall be required. Condenser electrical connection shall be by a factory wired plug. Fan shall be sized to provide full rated cooling capacity at 95 deg. F entering air. Provide wire guards on condenser coil and fan discharge.
- H. Manufacturers: Airdale, Carrier, Daikin, EMI, LG HVAC, McQuay, Mitsubishi Electric, Panasonic, Sanyo Air Conditioning Products.
1. Any listed equivalent manufacturer and the Mechanical Contractor shall be completely responsible to comply with all requirements on the contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades.

PART 3 – EXECUTION

3.1 REFRIGERATION EQUIPMENT

- A. All equipment to be installed in accordance with manufacturer's recommendations.

3.2 AIR-COOLED CHILLER

- A. Install in accordance with manufacturer's recommendations. Unit shall be properly supported and vibration isolated.
- B. Provide pipe insulation and jacketing over freeze protection electric heaters on all exterior water piping. Coordinate with the work of Division 16.
- C. Provide 30% glycol solution in chilled water piping system.

3.3 DUCTLESS SPLIT SYSTEMS

- A. Install split system units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
- B. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory mounted.
 - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements. Do not proceed with equipment start-up until wiring installation is acceptable.

3.4 INSTALLATION OF AIR-COOLED WATER CHILLER

- A. Install in accordance with manufacturer's instructions.
- B. Provide for connection to electrical service.
- C. Provide Neoprene Isolation Pads to reduce vibration transmission.
- D. Arrange piping for easy dismantling to permit tube cleaning.
- E. Provide piping from chiller relief valve to outdoors. Size as recommended by manufacturer and ANSI/ASHRAE Standard 15.
- F. Manufacturer's Field Services
 - 1. Manufacturer shall furnish a factory trained service engineer without additional charge to start the unit(s). Representatives shall provide leak testing, evacuation, dehydration, and charging of the unit(s) as required. Chiller manufacturers shall maintain service capabilities to promptly respond within 24 hours or less to service calls at the site.
 - 2. A start-up log shall be furnished by the manufacturer to document the chiller's start-up date and shall be signed by the owner or his authorized representative prior to commissioning the chillers.
 - 3. The manufacturer shall furnish complete submittal wiring diagrams of the chiller(s) starter(s) and associated components such as pumps, interlocks, etc. as applicable.

3.5 FIELD QUALITY CONTROL

- A. Start-up all units in accordance with manufacturer's start-up instructions. Replace damaged or malfunctioning controls and equipment.

END OF SECTION 230450

SECTION 23 04 51

VARIABLE REFRIGERANT FLOW SPLIT SYSTEM HEAT RECOVERY WITH
SIMULTANEOUS HEATING AND COOLING

PART 1 – GENERAL

1.1 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 Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

1.2 DESCRIPTION OF WORK

- A. This Section includes labor, material, equipment and supervision for the following:
 - 1. Single or Multiple Outdoor Condensing Units
 - 2. Multiple Indoor Ceiling Cassette Cooling Units.
 - 3. MCU refrigerant control unit(s) for simultaneous distribution of liquid and hot gas refrigerant to fan coil units for simultaneous heating and cooling operation.
- B. Provide complete refrigeration system including condensing units, cooling units, aboveground refrigerant piping, and all required controls and accessories for a complete and operable system.
- C. The variable capacity, air conditioning system shall be a split system consisting of ductless evaporators exclusively matched to the outdoor condensing unit.

1.3 REFERENCE STANDARDS

- A. Refer to Section 230200 for a general description of requirements applying to this section.
- B. Comply with applicable provisions of:
 - 1. International Mechanical Code
 - 2. ASME Codes for Pressure Vessels
 - 3. A.R.I. Capacity Ratings
 - 4. NFPA Pamphlets
 - 5. ASHRAE Standard 15
 - 6. ASHRAE Standard 90.1, Section 6, Table 6.8.1A thru J, minimum equipment efficiency.
 - 7. ISO 9001 and 14001.

1.4 QUALITY ASSURANCE

- A. Refer to Section 230210 for a general description of requirements applying to this Section.

- B. The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
- C. All wiring shall be in accordance with the National Electric Code (NEC).
- D. The system shall be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
- E. The outdoor unit shall be factory charged for a length of 25 feet of refrigerant with R410A refrigerant.
- F. A dry air holding charge shall be provided in the evaporator(s).

1.5 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 230200.
- B. Submit the following:
 - 1. Shop drawings and product data for all equipment in this section.

1.6 SUBSTITUTIONS

- A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, this Contractor shall be responsible for any and all additional costs associated with the changes required by other trades.

1.7 WARRANTY/GUARANTEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements. In addition, the following special guarantee applies:
 - 1. Manufacturer shall warrant all refrigeration equipment including parts and labor, for one (1) year from start-up.
 - 2. Compressors shall be warranted for parts only for an additional four (4) years.

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. The system performance shall be in accordance with ARI 210/240 test conditions as shown in the performance table below. System refrigerant piping shall be sized and installed per the manufacturer's piping diagrams and piping procedures.

- B. The cooling performance is based on 80°F DB / 67°F WB for the indoor unit and 95°F DB / 75°F WB for the outdoor unit and 25 feet of piping.
- C. The operating range in cooling will be 23°F DB ~ 115°F DB.
- D. Provide all equipment, materials, programming and technical support as required to interface with the Trane DDC System as defined in Section 230900.

2.2 INDOOR UNIT

- A. General: The indoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. Both liquid and suction lines shall be individually insulated between the outdoor and indoor units. The unit shall have a self diagnostic function, 3-minute time delay mechanism, and have a factory pre-charge of R410A adequate for 25 feet of total length.
- B. Unit Cabinet Ceiling Recessed Type:
 - 1. The indoor unit shall have a finished cabinet for exposed ductless applications.
 - 2. The drain and refrigerant piping shall be concealed above the finished ceiling for flexible installation from the right side.
 - 3. The cabinet shall be supplied with suspension bracket for securely mounting the cabinet to threaded rod.
 - 4. The cabinet includes a receiver to accept signals from a wired remote controller.
 - 5. The indoor unit shall include a stub duct connection for air distribution to an adjoining zone as shown on the drawings.
 - 6. The indoor unit shall include a factory mounted and wired high lift condensate drain pump capable of 29" lift. The condensate pan shall be internally trapped.
- C. Unit Cabinet Ceiling Concealed Ducted Type:
 - 1. The indoor unit shall have a galvanized steel, insulated cabinet for ceiling concealed ducted supply and return air applications.
 - 2. The drain and refrigerant piping shall be concealed above the finished ceiling for flexible installation from the right side.
 - 3. The cabinet shall be supplied with suspension bracket for securely mounting the cabinet to threaded rod.
 - 4. The cabinet includes a receiver to accept signals from a wired remote controller.
 - 5. The indoor unit shall include a high lift condensate drain pump accessory, where applicable, capable of 29" lift. The condensate pump shall be internally trapped.

D. Fan:

1. The evaporator fan shall be an assembly with of a direct-driven single motor.
2. The fan shall be statically and dynamically balanced and operate on a motor with permanent lubricated bearings.
3. The indoor fan shall offer a choice of three speeds, High, Medium, and Low.
4. The supply air shall be distributed to the space through a 4-way blow wide blade grille.
5. The return air shall be returned to the unit through an integral center return air grille.

E. Filter:

1. The return air filter shall be integral to the unit and shall be replaceable and washable.

F. Coil:

1. The evaporator coil shall be a nonferrous, aluminum fin on copper tube heat exchanger.
2. All tube joints shall be brazed with silver alloy.
3. All coils shall be factory pressure tested.
4. A condensate pan shall be provided under the coil with a drain connection.
5. The evaporator coil shall be controlled by a factory mounted electronic thermal expansion valve.

G. Electrical:

1. The indoor unit shall be powered by 208 volt, 1 phase, 60 hertz power.

H. Control:

1. The indoor fan coil unit shall have a wired remote controller capable to operate the system.
2. The wired remote controller shall control: on/off operation, operation mode, fan speed, temperature set point and filter alarm.
3. The wired remote control shall perform fault diagnostic functions which may be system related, indoor unit or outdoor unit related depending on the fault code. Temperature range on the remote control shall be 64°F to 90°F in cooling mode and 50°F to 86°F in heating mode.
4. The indoor unit microprocessor shall have the capability to receive and process commands via return air temperature and indoor coil temperature sensors enabled by commands from the remote control.

5. The system shall have automatic restart capability after a power failure has occurred.
 6. Each system shall be networked to a centralized controller with data management service device to provide local schedule and set point control, error history management, and web server browsing from static IP address.
- I. Sound:
1. Indoor unit sound levels shall not exceed: 41 dBA
- J. MCU Refrigerant Distribution Control Module:
1. The MCU unit shall include refrigerant liquid, suction and hot gas connections to the outdoor unit. All three refrigerant lines shall be insulated from the MCU to the outdoor unit.
 2. The MCU unit shall include refrigerant liquid and vapor connections to the indoor units.
 3. The MCU unit shall include a 208/230-1-60 power supply connection.
 4. The MCU shall include a condensate drain connection.
 5. The MCU shall include a control communications connection for network to the indoor fan coil units and outdoor air-cooled condensing unit(s).
 6. The MCU shall include heating and cooling solenoid valves for automatic distribution of liquid refrigerant or hot gas for simultaneous heating and cooling fan coil operation.

2.3 OUTDOOR UNIT

- A. General: The outdoor unit(s) shall be specifically matched to the corresponding indoor unit size(s). The outdoor unit(s) shall be complete factory assembled and pre-wired with all necessary electronic and refrigerant controls.
- B. Unit Cabinet: The cabinet shall be ivory with a finished powder coated baked enamel paint.
- C. Fan
1. The fan shall be a direct drive, propeller type fan.
 2. The motor shall be BLDC type with permanently lubricated type bearings and inherent overload protection.
 3. The fan shall be capable of high static operation up to 0.31" WC for ducted applications.
 4. A fan guard is provided on the outdoor unit to prevent contact with fan operation.
 5. Airflow shall be vertical discharge.

- D. Coil: The outdoor coil shall be nonferrous construction with corrugated fin tube.
- E. Compressors:
 - 1. The outdoor unit shall have a minimum two compressors. One compressor shall be a Copeland digital scroll compressor with 10% to 100% capacity modulation and one compressor shall be a Copeland fixed scroll compressor. Outdoor unit shall be capable of capacity modulation down to 10% of full load capacity.
 - 2. The outdoor unit shall have an accumulator.
 - 3. The compressor shall have an internal thermal overload.
 - 4. The outdoor unit shall operate with a maximum vertical height difference of 164 feet and overall maximum piping length of 3280 feet and maximum 721 feet (equivalent length) from outdoor unit to furthest indoor unit.
- F. Electrical:
 - 1. The outdoor unit shall be powered as scheduled on the drawings.
 - 2. The outdoor shall be controlled by a microprocessor located in the outdoor unit and via signals from the indoor units.
- G. Sound: Outdoor unit sound levels shall not exceed: 64 dBA.

2.4 DESIGN MAKE: Samsung

2.5. MANUFACTURERS: Daikin, Samsung, Mitsubishi (Citi-Multi), LG HVAC, Panasonic.

- A. Any listed equivalent manufacturer and the Mechanical Contractor shall be completely responsible to comply with all requirements on the contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades.

PART 3 – EXECUTION

3.1 REFRIGERATION EQUIPMENT

- A. All equipment shall be installed in accordance with manufacturer's recommendations.

3.2 FIELD QUALITY CONTROL

- A. The system shall be installed under the supervision of a certified manufacturer's representative.
- B. Start up all units in accordance with manufacturer's start-up instructions. Replace damaged or malfunctioning controls and equipment.

- C. Start up service and first year preventative/emergency service shall be provided by the manufacturer's authorized representative.
- D. Customer operator training shall be provided by the manufacturer's authorized representative.

END OF SECTION 23 04 51

SECTION 23 05 00

PIPING SYSTEMS & ACCESSORIES – HVAC

PART 1 – GENERAL

1.1 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 Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

1.2 DESCRIPTION OF WORK

- A. This Section includes the following equipment:
 - 1. Base-Mounted End Suction Pumps
 - 2. Suction Diffusers
 - 3. Diaphragm-Type Expansion Tanks
 - 4. Air Separators
 - 5. Solids Separator
 - 6. Relief Valve (Water Systems)
 - 7. Balancing Valves
 - 8. Combination Valve Package for Pumps
 - 9. Flexible Pump Connectors

1.3 REFERENCE STANDARDS

- A. Refer to Section 230200 for a general description of requirements applying to this section.

1.4 QUALITY ASSURANCE

- A. Refer to Section 230210 for a general description of requirements applying to this Section.
- B. Whenever a variable frequency PWM drive is installed to control an AC motor, a maintenance-free, circumferential, conductive micro fiber shaft grounding ring shall be installed on the AC motor drive end to discharge shaft currents to ground. Recommended part: AEGIS SGR™ Bearing Protection Ring, as made by Electro Static Technology. Install in accordance with the manufacturer's written instructions.

1.5 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 230200.

- B. Submit the following:
 - 1. Shop Drawings
 - 2. Manufacturers Product Data
 - 3. Test Reports on Piping System Tests

1.6 SUBSTITUTIONS

- A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, this Contractor shall be responsible for any and all additional costs associated with the changes required by other trades.

1.7 WARRANTY/GUARANTEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements.

PART 2 – PRODUCTS

2.1 BASE-MOUNTED END SUCTION PUMPS

- A. Provide frame-mounted end suction pumps where indicated, and of capacities and having characteristics as scheduled.
- B. Horizontal mount, single stage, flexible coupling, base-mounted, designed for 175 psi working pressure.
- C. Cast iron casing 125 psi ANSI flanges, tappings for gauge and drain connections.
- D. Steel shaft with replaceable shaft sleeve, regreasable ball bearings and mechanical seals with carbon seal ring and ceramic seat.
- E. Non-overloading motor at any point on pump curve, open, drip-proof, ball bearings, 15,000 hours bearing life, with lifting lug on top of motor.
- F. Provide open drip-proof motor with regreasable ball bearings.
- G. Enclosed type impeller hydraulically and dynamically balanced, keyed to shaft and secured with locking screw.
- H. Structural steel baseplate with welded cross members, and open grouting area.
- I. Flexible coupling capable of absorbing torsional vibration, equipped with coupling guard.
- J. Manufacturers: Subject to compliance with requirements, provide pumps of one of the following:

Armstrong Pumps
Bell & Gossett
Aurora
Ingersoll Rand
Peerless
Patterson
Paco
Taco

2.2 SUCTION DIFFUSERS

- A. Provide at each base-mounted pump, a suction diffuser of size required for pump connection. Units shall consist of angle type body with straightening vanes and combination diffuser-strainer-orifice cylinder with 3/16" diameter openings for pump protection. A permanent magnet shall be located within the flow stream and shall be removable for cleaning. The orifice cylinder shall be equipped with a disposable fine mesh strainer which shall be removed after system start-up. Orifice cylinder shall be designed to withstand pressure differential equal to pump shutoff head and shall have a free area equal to five times cross section area of pump suction opening. Straightening vanes shall extend the full length of the orifice cylinder and shall be replaceable. Unit shall be provided with adjustable support foot to carry weight of suction piping.
- B. Manufacturers: by pump manufacturer.

2.3 DIAPHRAGM-TYPE EXPANSION TANKS (VERTICAL OR HORIZONTAL)

- A. Fabricate tank of continuously welded steel plate of the size shown conforming to ASME Section VIII Standards, maximum working pressure of 125 psi.
- B. Provide air charging valve, drain-offs, system connection and other piping connections. Paint outside of tank with a zinc chromate primer.
- C. Provide a standard cleanout hole located in the tank head.
- D. Tank shall have a sealed-in heavy-duty butyl diaphragm suitable for operation from 40 to 240°F.
- E. Tank shall be furnished with an ASME stamp.
- F. The tanks shall be manufactured by Amtrol, Bell and Gossett, Patterson, Stover Tanks, Taco, Wheatley, John Wood.

2.4 AIR SEPARATORS

- A. Furnish and install, as shown on plans, a centrifugal type air separator. The unit shall have NPT or flanged inlet and outlet connections tangential to the vessel shell. Vessel shell diameter to be three times the nominal inlet/outlet pipe diameter.

- B. The unit shall have an internal stainless steel air collector tube with 5/32" diameter perforations and 63% open area designed to direct accumulated air to the compression tank via an NPT connection at top of unit.
- C. The unit shall have a removable galvanized steel system strainer with 3/16" diameter perforations and a free area of not less than five times the cross-sectional area of the connecting pipe. A blowdown connection shall be provided to facilitate routine cleaning of the strainer.
- D. Manufacturer to furnish data sheet specifying air collection efficiency and pressure drop at rated flow.
- E. A manufacturers' Data Report for Pressure Vessels, Form U-1 as required by the provisions of the ASME Boiler and Pressure Vessel Code shall be furnished for each air separator upon request.
- F. Manufacturers:
 - Armstrong
 - Bell & Gossett
 - Patterson
 - Taco, Inc.
 - Thrush Div., Amtrol, Inc.
 - John Woods
 - Wheatley

2.5 SOLIDS SEPARATOR

- A. Provide a solids separator of sufficient capacity to handle 5 percent to 10 percent of system flow (GPM) to create a 6 pound to 10 pound pressure drop through the unit.
- B. Separator shall be factory primed and painted.
- C. Manufacturer: Griswold, McQuay, Metraflex Co., Orival, Lakos as made by Claude Laval Corp. or Yardney.

2.6 RELIEF VALVE (WATER SYSTEMS)

- A. Each water circulating system of the closed type shall be provided with a pressure relief valve selected to suit the system heat generation capacity and set at 75 psig.
- B. This discharge from the relief valves shall be piped to a drain.
- C. Relief valves shall be manufactured by McDonnell and Miller, Bell and Gossett, A.W. Cash Company.

2.7 BALANCING VALVES

- A. Balancing valves to be installed where indicated.

- B. Furnish and install, as shown on the plans, balancing valves with provision for connecting a portable differential (Ft. of Head) pressure meter. Each meter connection shall have pressure/temperature readout ports.
- C. The balancing valves shall be Y-pattern style design and all metal parts of non-ferrous, pressure die-cast, nonporous Ametal copper alloy. Each valve can be installed in any direction without affecting flow measurement and shall provide four (4) functions:
 - 1. Precise flow measurement
 - 2. Precision flow balancing
 - 3. Positive shut-off with no drop seat and teflon disc
 - 4. Drain port suitable for hose bib fitting.
- D. The valves shall have four (4) 360 deg. adjustment turns of handwheel for maximum setting with hidden memory feature to program the valve with precision tamperproof balancing setting.
- E. Design Pressure/Temperature:
 - ½" - 3" NPT connections 300 psig at 250°F.
 - ½" and ¾" sweat connections 200 psig at 250°F.
 - 4" flanged connections 125 psig at 250°F.
- F. Flow sensor: For installation in piping 5" and larger, a precision wafer type orifice insert installed between standard 125 psi at 250°F ANSI flanges to monitor system flow; cast iron body with integral brass EPT check valves to accommodate a differential pressure meter; furnish with calibrated nameplate with flow range through a range of differential head pressures; provide globe valve at each sensor to adjust flow to design conditions.
- G. Manufacturers: Tour & Anderson, Armstrong, Bell & Gossett, Nexus Valve, Taco, Wheatley.

2.8 COMBINATION VALVE PACKAGE FOR PUMPS

- A. Each centrifugal pump shall be provided with the following valve assemblies:
 - 1. Combination silent check valve, balancing valve and shut-off valve on pump discharge.
- B. The combination units shall be flanged assemblies of 125 lb. ASA Class, 175 psi. W.O.G. @ 300°F. The combination units shall be suitable for vertical or horizontal installation with the stem pointing up.
- C. The body and bonnet shall be cast semi-steel; and the stem, seat and disc shall be bronze. The valve shall be designed for repacking under pressure.
- D. The unit shall be provided with a calibrated stem indicator, and the check valve shall have a stainless steel spring and be provided with disc designed for quiet operation at low flow rates.
- E. Manufacturers: by Pump Manufacturer.

2.9 FLEXIBLE PUMP CONNECTORS

- A. Provide braided stainless steel pump connector(s) manufactured with annular corrugated stainless steel close-pitch hose with stainless steel overbraid. The corrugated metal hose, braid(s), and a stainless steel ring-ferrule/band (material gauge not less than .048") must be integrally seal-welded using a 100% circumferential, full-penetration TIG weld.
- B. End fittings shall be flat-face plate steel flanges with 150# ANSI drilling and outside diameter. Fittings must be attached using a 100% circumferential TIG weld. Braided stainless steel pump connector(s) must be suitable for operating temperatures up to 850°F. The rated working pressure of the braided metal hose must have a minimum 4:1 safety factor.
- C. Each braided stainless steel pump connector shall be individually leak tested by the manufacturer using air-under-water or hydrostatic pressure. Flanged pump connectors shall be prepared for shipment using cut-to-length spacers, securely positioned between the flanges to prevent axial compression damage and maintain the manufactured length. Spacers must be removed prior to system start-up.
- D. Manufacturers: Amber/Booth, Flex-Hose Co., Inc., Mason Industries, Metra-Flex, Patterson, Proco Products, Inc., Twin City Hose, Inc.

PART 3 – EXECUTION

3.1 CIRCULATING PUMPS

- A. Pump shall be installed in accordance with recommendations of the Hydraulic Institute.
- B. Suction reducers shall be eccentric and located at the pump suction. Discharge increasers shall be concentric and located at the pump discharge.
- C. Suction and discharge piping shall be adequately supported without imposing any load on the pump casing.
- D. Pressure gauges shall be installed at the suction and discharge of each pump.
- E. Vibration isolation equipment shall be provided where noted.
- F. Impeller diameter used shall be approximately 85% of the maximum impeller diameter capable of being supplied for each pump.
- G. The motor nameplate horsepower shall not be exceeded under any conditions of pump operation.
- H. Prior to shipment, each pump shall be tested to insure its capability to produce the required capacity at the design head, and when requested written verification of this test shall be supplied.
- I. Before grouting and piping the pump, the Contractor shall check to insure pump alignment is satisfactory, and where required, realign the pump. Fill baseplate with non-shrink grout to the top of the base rail.

- J. Start-up service shall be provided by the pump manufacturer or his representative. This service shall include the following:
1. Check alignment
 2. Check absence of pipe strain
 3. Check lubrication
 4. Check rotation
 5. Take suction and discharge pressure gauge readings and compare with pump nameplate for operating head.
 6. Take voltage and current readings and compare with motor nameplate.
 7. Insure proper maintenance manuals are available if required.

3.2 BYPASSES

- A. Three-valve bypasses shall be provided in piping where indicated on drawings.
- B. The bypasses shall consist of two gate valves and one globe or angle valve. The bypass pipe size shall be at least equal to the control valve size.

3.3 PIPING SYSTEM DRAINS

- A. All piping shall be graded or pitched toward drain locations which shall be provided with gate valve unless otherwise indicated on drawings or specified. Individual risers may be drained through removable plugs or caps.
- B. Drain valves shall be provided at all major components in systems.

3.4 ECCENTRIC PIPE FITTINGS

- A. Eccentric pipe fittings shall be furnished and installed in all piping and circulated water piping where a change in pipe size occurs in a horizontal run. In water systems the top of the adjacent pipe sections shall be maintained level.

3.5 CHEMICAL CLEANING

- A. Closed recirculating systems shall be filled and sufficient detergent and dispersant added to remove all dirt, oil and grease. System shall be circulated for at least 48 hours after which a drain valve at the lowest point shall be opened and allowed to bleed while the system continues to circulate. The automatic make-up valve shall be checked to be sure it is operating. Bleeding shall continue until water runs clear and all detergent is removed. A sample of water shall be tested and if pH exceeds 8.0, draining should be resumed.

- B. Drain all detergent solution from system piping and equipment to nearest floor drain or indirect waste point connected to the building's sanitary system.

END OF SECTION 23 05 00

SECTION 23 05 10

WATER TREATMENT (HVAC)

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- 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 Section 230200 for HVAC General Provisions.
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

1.2 DESCRIPTION OF WORK

- A. This Section includes labor, material, equipment and supervision to provide a complete water treatment system for the following:
 - 1. Cleaning and treatment of circulating HVAC chilled water system.
 - a. Cleaning Compounds.
 - b. Chemical Treatment for Closed Loop Systems.
 - c. Glycol Water Systems

1.3 REFERENCE STANDARDS

- A. Refer to Section 230200 for a general description of requirements applying to this section.
- B. Requirements established within the portions of the Project Manual titled Division 1, General Requirements, are collectively applicable to the work of this section.
- C. Technical Services: Provide the services of an experienced water treatment chemical engineer or technical representative to direct flushing, cleaning, pre-treatment, training, debugging, and acceptance testing operations; direct and perform chemical limit control during construction period and monitor systems for a period of 12 months after acceptance, including not less than four service calls and written status reports. Minimum service during construction/start-up shall be 8 hours.
- D. Field Quality Control and Certified Laboratory Reports: During the one year guarantee period, the water treatment laboratory shall provide not less than 12 reports based on on-site periodic visits, sample taking and testing, and review with Owner, of water treatment control for the previous period. In addition to field tests, the water treatment laboratory shall provide certified laboratory test reports. These monitoring reports shall assess chemical treatment accuracy, scale formation, fouling and corrosion control, and shall contain instructions for the correction of any out-of-control condition.

- E. Log Forms: Provide one year supply of preprinted water treatment test log forms.

1.4 SUBMITTALS

In accordance with Section 230200 provide the following:

- A. Manufacturer's Literature and Data:
 - 1. Cleaning compounds and procedures.
 - 2. Chemical treatment for closed systems.
 - 3. Chemical treatment for steam systems, including installation and operating instructions.
 - 4. Chemical treatment for open loop systems.
 - 5. Glycol water heat transfer systems.
- B. Water analysis verification.
- C. Materials Safety Data Sheet for all proposed chemical compounds.
- D. Maintenance and operating instructions.

PART 2 – PRODUCTS

2.1 CLEANING COMPOUNDS:

- A. Alkaline phosphate or non-phosphate detergent/surfactant/specifically to remove organic soil, hydrocarbons, flux, pipe mill varnish, pipe compounds, iron oxide, and like deleterious substances, with or without inhibitor, suitable for system wetted metals without deleterious effects.
- B. Refer to Section, PIPING SYSTEMS & ACCESSORIES - HVAC, PART 3, for flushing and cleaning procedures.

2.2 CHEMICAL TREATMENT FOR CLOSED LOOP SYSTEMS:

- A. Inhibitor: Provide sodium silicate, sodium nitrite/borate, or other approved proprietary compound suitable for make-up quality and make-up rate and which will cause or enhance bacteria/corrosion problems or mechanical seal failure due to excessive total dissolved solids. Shot feed manually. Maintain inhibitor residual as determined by water treatment laboratory, taking into consideration residual and temperature effect on pump mechanical seals.
- B. pH Control: Inhibitor formulation shall include adequate buffer to maintain pH range of 8.0 to 10.0.
- C. Performance: Protect various wetted, coupled, materials of construction including ferrous, and red and yellow metals. Maintain system essentially free of scale, corrosion, and fouling. Corrosion rate of following metals shall not exceed specified mills per year penetration; ferrous, 0.5; brass, 0.2; copper, 0.15. Inhibitor shall be stable at equipment skin surface temperatures and bulk water temperatures of, respectively, not less than 250 and 125 degrees Fahrenheit. Heat exchanger fouling and capacity reduction shall not exceed that allowed by fouling factor 0.0005.

D. Water Analysis: Confirm raw water analysis or provide analysis if none is furnished.

Description	Year (Avg.)
Silica (SiO ₂)	_____
Insoluble	_____
Iron & Aluminum	_____
Calcium (Ca)	_____
Magnesium (Mg)	_____
Sodium & Potassium (Na & K)	_____
Carbonate (CO ₃)	_____
Bicarbonate (HCO ₃)	_____
Sulfate (SO ₄)	_____
Chloride (Cl)	_____
Nitrate (NO ₃)	_____
Turbidity	_____
pH	_____
Residual Chlorine	_____
Total Alkalinity	_____
Non Carbonate Hardness	_____
Total Hardness	_____
Dissolved Solids	_____
Fluorine	_____

E. Conduct performance test to prove capacity and performance of treatment system.

Raw water total hardness, ppm.

Concentration cycles.

Raw water, pH.

System water, pH.

Chemical solution used.

Acid solution used, obe.

Quantity of chemical solution injected into system per cycle.

Quantity of acid injected into system per cycle.

Make up water required.

Waste to drain requirement.

F. Recommended Conditions

1. Buffered Nitrite:

- a. For temperatures 140°F to 180°F - 1000 ppm as sodium nitrite.

2. Molybdate:

- a. 50 - 100 ppm as molybdate (chilled water).

3. pH - 7.0 to 10.0

2.3 GLYCOL-WATER SYSTEMS

- A. Propylene glycol shall be inhibited with 1.75 percent dipotassium phosphate. Do not use automotive anti-freeze because the inhibitors used are not needed and can cause a sludge precipitate that interferes with heat transfer. Initial fill of system shall be factory mixed.
- B. Contractor shall provide required amount of glycol to obtain the percent by volume for glycol-water systems as follows and to provide one-half tank reserve supply:
 - 1. 30% propylene-glycol for chilled water system.
- C. Pot Feeder Make-up Unit: Bypass type for chemical treatment, Schedule 10 gauge heads, 3/4" system connections and large neck opening for chemical addition. Feeders shall be two (2) gallon minimum size.
- D. Glycol-Water Make-up System:
 - 1. Glycol-Water Storage Tank: Self-supporting or polyethylene, minimum 90 mil thickness, with removable cover or black steel with 90 mil polyethelene insert. Capacity shall be 55 gallons, with approximate diameter of 23 inches and height of 36 inches. Reinforced threaded pipe connections shall be provided for all connections. Provide identification for tank showing name of the contents.

2. Glycol-Water Make-up Pump: Bronze fitted, self-priming, high head type suitable for pumping a 33 percent to 50 percent glycol-water solution in intermittent service. The pump shall be provided with a mechanical shaft seal and be flange connected to a 1750 rpm NEMA Type "C" motor. The pump capacity shall be three gpm, 50 psig discharge pressure with a suction lift capability of five inches of mercury, with a 1/3 horsepower drip-proof motor. The pump may be a "gear-within-a-gear" positive displacement type with built-in relief valve set for 43 psig, or the pump may be a regenerative turbine type providing self-priming with built-in or external relief valve set for design head of the pump.
3. Back pressure regulating valve: Spring loaded, diaphragm actuated type with bronze or steel body, stainless steel trim with capacity to relieve 100 percent of pump flow with an allowable rise in the regulated pressure of 10 psi above the setpoint. Setpoint shall be 15 psi above system PRV setting.
4. Low Water Level Control: Steel or cast iron float housing, stainless steel float, positive snap-acting SPST switch mechanism, rated 10 AMPS-120 volt AC, in General Purpose (NEMA 1) enclosure. The control shall be rated for pressures to 150 psig and make alarm circuit on low water level. The alarm circuit shall be wired to an alarm light on the nearest local temperature control panel.

E. Propylene Glycol:

1. Inhibited, propylene glycol based fluid shall be suitable for a temperature range of -50°F to 250°F.
2. Fluid shall have special industrial inhibitors designed to prevent corrosion within piping systems and accessories for HVAC service.
3. Fluid shall provide burst protection for chilled water system with a solution concentration of 30% by volume.
4. Typical physical properties: (Based on 50% concentration by volume, at 40°F)
 - a. Max operating temperature, 320°F.
 - b. Freezing point, -28°F.
 - c. Thermal conductivity, 0.204 Btu/(hr-sf) (F/ft).
 - d. Specific heat, 0.794 Btu/lb-F.
 - e. Viscosity, 14.0 cps.
 - f. Density, 66.68 lb/cf.
 - g. Color, fluorescent yellow.
5. Manufacturers: Dow Chemical Co., DOWFROST HD.

PART 3 – EXECUTION

3.1 INSTALLATION:

- A. Delivery and Storage: Deliver all chemicals in manufacturer's sealed shipping containers. Store in designated space and protect from deleterious exposure and hazardous spills.

- B. Install equipment furnished by the chemical treatment supplier and charge systems according to the manufacturer's instructions and as directed by the Technical Representative.
- C. Perform tests and report results.
- D. Instruct owner personnel in system maintenance and operation.

3.2 INSPECTIONS AND MAINTENANCE:

- A. Furnish complete inspection and maintenance service on water treatment equipment for a period of one year after completion and acceptance of the water treatment equipment installation. This maintenance service shall begin concurrently with the guarantee. Maintenance work shall be performed by skilled personnel directly employed and supervised by the same company that provided the water treatment equipment specified herein.
- B. The maintenance service shall include the following:
 - 1. Monthly systematic examination of equipment.
 - 2. Cleaning, lubricating, adjusting, repairing and replacing of all parts as necessary to keep the equipment in first-class condition and proper working order.
 - 3. Furnishing all lubricant, cleaning materials and parts required.
 - 4. The operational system shall be maintained to the manufacturer's standards specified including any changes and/or adjustments required to meet varying conditions.
 - 5. Provide 24 hour emergency call-back service which shall consist of promptly responding to calls within two hours for emergency service should a shutdown or emergency trouble develop between regular examinations. Overtime emergency call-back shall be limited to minor adjustments and repairs required to protect the immediate safety of the equipment.
 - 6. Service personnel shall report to the owner or his authorized representative upon arrival and again upon completion of the required work. A copy of the work ticket containing a complete description of the work performed shall be given to the owner.
 - 7. The Contractor shall maintain a log in the Mechanical Room. The log shall list the date and time of all monthly examinations and all trouble calls. Each trouble call shall be fully described including the nature of the call, necessary correction performed and/or parts replaced.

END OF SECTION 23 05 10

SECTION 23 06 00

AIR DISTRIBUTION & ACCESSORIES – HVAC

PART 1 – GENERAL

1.1 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 Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.
- D. This Contractor shall coordinate with the work of Division 26 and the Fire Alarm System vendor for locations and mounting of all duct smoke detectors. These devices are shown on the Mechanical Drawings for reference only to show the intent of the work. All locations shall be determined based on approved shop drawings from the Fire Alarm System vendor and the Contractor for the work of Division 26, Electrical. Mount smoke detectors in the supply and return air stream at each unit in accordance with NFPA 72.

1.2 DESCRIPTION OF WORK

- A. This Section includes labor, material, equipment and supervision to provide a complete air distribution system as specified herein and as shown on drawings.
 - 1. Ductwork – Single Wall, Square and Rectangular
 - 2. Ductwork - Single Wall, Spiral Round
 - 3. Double Wall Ductwork – Square and Rectangular
 - 4. Flexible Air Duct
 - 5. Acoustic Flexible Air Duct
 - 6. Flexible Connections
 - 7. Dampers
 - 8. Fire Dampers
 - 9. Air Diffusers, Registers and Grilles
 - 10. Sound Attenuation

1.3 REFERENCE STANDARDS

- A. Refer to Section 230200 for a general description of requirements applying to this section.
- B. Requirements established within the portions of the Project Manual titled Division 1, General Requirements, are collectively applicable to the work of this section.
- C. IMC (International Mechanical Code).
- D. SMACNA (Sheet Metal and Air Conditioning Contractors National Association, Inc.)

- E. American Society of Heating, Refrigerating and Air Conditioning Engineers' recommendations in ASHRAE Guide shall apply to this work.
- F. ARI Standard 885 - Standard for Estimating Occupied Sound Levels in the Applications of Air Terminals and Air Outlets.
- G. UL (Underwriter's Laboratories, Inc.)
- H. NFPA 90A shall apply to this work.
- I. State Fire Prevention Regulations.

1.4 QUALITY ASSURANCE

- A. Refer to Section 230210 for a general description of requirements applying to this Section.

1.5 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 230200.
- B. Submit the following:
 - 1. Shop drawings of all sheet metal. Indicate all steel, piping, conduit, and Architectural/Structural features to demonstrate complete coordination. Scale shall not be less than 1/4".
 - a. Shop drawings shall indicate the sizes and lengths of each section of ductwork as well as all system components such as access doors, dampers, diffusers and register locations. Also indicate the type of joints used and where internal acoustic lining or insulation, if required, will be utilized.
 - b. The location of the duct runs and the air outlets shall be closely coordinated with all other trades by the sheet metal contractor to avoid interference. The shop drawings shall show the contact surfaces adjacent to the ducts or air outlets and the space assigned for concealment. The drawings shall indicate principal items of equipment, adjacent piping and conduit, etc., the location of which shall be secured from the contractors of other trades.
 - c. Sheet Metal Contractor to include resubmissions of the shop drawings to the Engineer. The resubmissions are to include all corrections to previous submissions.
 - 2. Manufacturer's literature and performance data of all equipment and devices.
 - 3. Samples: Furnish color samples, etc., at request of the Architect.

1.6 SUBSTITUTIONS

- A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but shall not be limited to space requirements, code clearances, the type,

horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, they shall be responsible for any and all additional costs associated with the changes required by other trades.

1.7 WARRANTY GUARANTEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements.

PART 2 – PRODUCTS

2.1 DUCTWORK (SINGLE WALL, SQUARE AND RECTANGULAR)

- A. All ductwork shall be fabricated in accordance with SMACNA "HVAC Duct Construction Standards - Metal and Flexible" latest Edition except as described below. The minimum thickness of metal ductwork is 26 gauge. Fabrication requirements shall be based on ductwork subjected to positive or negative pressures of 4" W.G. Ductwork systems shall be sealed to SMACNA "Seal Class "A" Standards. Alternatively, "Ductmate" System 45 can be used in accordance with manufacturer's specifications. Drive slip joints are not permitted.

Exception: For ductwork smaller than 12" x 8", Contractor may provide slip and drive joints with all joints sealed with Hardcast tape and mastic system.

- B. Rectangular ducts for 4" W.G. or less, positive or negative pressure shall be per SMACNA Table 1-7. Longitudinal seams shall be Pittsburgh Lock Type L-1 per SMACNA Figure 1-5. Transverse joints shall be standing seam type T -15 per Figure 1-4.

- 1. In the event that material size is not compatible with duct size and segmenting must be utilized to fabricate duct, use SMACNA Figure 1-5, seam L-4 (Standing Seam).

- C. Joints:

- 1. Per SMACNA Transverse Joint Reinforcement Table 1-12, only joints T -22, T -25a, T -25b and Proprietary slip on flanges will be acceptable.
 - 2. Joints T -25a and T -25b that have stress fractures from bending will not be accepted.
 - 3. All joints will have butyl gasket 3/16" thick by 5/8" wide installed per manufacturer's -- installation instructions.

- D. Ductwork systems for this standard shall be galvanized sheet steel, commercial quality of lock - forming grade, conforming to ASTM coating standards A-525 or A-527 with coating of designation G-60.

- 1. Where the outer surface of the duct is exposed in finished spaces and is not scheduled for insulation, duct material shall be galvanized, suitable for field painting by the General Contractor.

- E. The size and configuration of each duct shall be indicated on design drawings. Where thicker sheets or different types of materials are required, they shall be specified on the design drawings or in the project specifications.

2.2 DUCTWORK (SINGLE WALL, SPIRAL ROUND)

- A. Design Pressure: 2”
- B. Leakage: All ductwork shall meet SMACNA Class "A" leak standards.
- C. Fabrication:
 - 1. Gauges, reinforcing angles, seams, joints, fabrication methods, installation methods and practices, duct reinforcement, fabricated dampers and devices installed in duct system, fittings, etc., shall conform to the latest editions of SMACNA standards for construction in accordance with requirements indicated in these specifications.
 - 2. Minimum metal gauges shall be 26 gauge (.019). Follow SMACNA Table 3-2A for Positive pressure and Table 3-2B for Negative pressure.
 - 3. Where the outer surface of the duct is exposed in finished spaces and is not scheduled for insulation, duct material shall be galvanized, suitable for field painting by the General Contractor.
- D. Joints:
 - 1. Duct up to 36" diameter - Male/Female beaded slip joint similar to SMACNA Figure 3-2, joint RT-1 or RT-5, as long as it meets the criteria for the system design pressure. Fittings shall be undersized to fit into spiral duct. All joints shall be secured with a minimum of 4 screws on each duct section (equally spaced). Seal joint with an approved sealant compound, continuously applied prior to assembly of joint and after fastening, making certain that the majority of the sealant resides on the interior of the joint.

2.3 DOUBLE WALL DUCTWORK – SQUARE AND RECTANGULAR

- A. Provide double wall construction ductwork where indicated on drawings.
- B. Construction (Outer Walls): Aluminum ductwork shall be 16-gauge. Bracing, supports, and joints shall be as specified for steel ductwork. Inner wall shall be perforated galvanized steel.
- C. Joints: Shall be companion angle, gasketed and watertight.
- D. Insulation:
 - 1. Fiberglass rigid duct board bonded with resins, 6 pound density, aluminum foil reinforced facing with fiberglass scrim, laminated to kraft, 2” thick.
 - 2. Thermal Conductivity: 0.23 Btu/HR/S.F. per inch at 75 deg. F.

3. Overlap butt joints 2” and seal with manufacturer recommended pressure sensitive tape. Insulation shall be banded with 18 guage, ½” wide bands on 2’-0” centers. In addition, on ductwork 24” and wider, support bottoms with mechanical fasteners; i.e., stick pins on 18” centers.
4. Manufacturers: Manville International Inc., Certain-Teed, Owens-Corning.

2.4 FLEXIBLE AIR DUCT

- A. Insulated flexible air duct shall be non-metallic. Air duct shall comply with the latest NFPA Bulletin No. 90A and be labeled as Class 0 or 1 Air Duct, U.L. Standard No. 181.
- B. Air ducts shall be suitable for working pressure of not less than plus 10.0 and minus 0.5 inches of W.G.
- C. Non-metallic air duct shall be two element spiral construction composed of a corrosion resisting metal supporting spiral and a vinyl coated fiberglass base fabric and shall be mechanically interlocked together.
- D. Insulation shall be fiberglass flexible blanket with vapor barrier outer jacket of polyethylene or reinforced mylar. Maximum thermal conductance of 0.23 Btu/Hr./SF/Inch at 75° F temperature.
- E. Approved manufacturers shall include the Wiremold Company, Flexmaster Ducting Inc., Owens-Corning, Thermaflex Flex Vent.

2.5 ACOUSTIC FLEXIBLE AIR DUCT (AUDITORIUM ONLY)

- A. Core material shall be an acoustical spun bond nylon fabric supported by helically wound galvanized steel. The fabric shall be mechanically fastened to the steel helix without the use of adhesive. The core shall maintain its free area and a center line radius of 1.0 or better.
- B. The internal working pressure rating shall be at least as follows with a bursting pressure of at least 2½ times the working pressure.
 1. Positive: 6 inches W. G.
 2. Negative: 4 inches W. G.
- C. The duct shall be rated for a velocity of at least 4,000 feet per minute.
- D. Suitable for operating temperatures of at least 250°F.
- E. Minimum Acoustic Performance:
 1. The insertion loss (dB) of a 9 foot length of duct when tested in accordance with ASTM E 477 at a velocity of 2,500 feet per minute shall be at least:

	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2,000 Hz	4,000 Hz
1) 8 inch dia.	9	27	27	32	33	37	33
2) 12 inch dia.	8	24	23	30	31	37	25

- F. Insulation shall be fiberglass flexible blanket with metalized vapor barrier, rated for R6.
- G. Manufacturer: Flexmaster USA, Type "6M"

2.6 FLEXIBLE CONNECTIONS

- A. Required between ductwork and suction and discharge connection of all fans and air handlers.
- B. Material: Woven fiberglass with mounting hardware tested in accordance with UL Standard 181, listed and labeled as Class 0 or 1.
- C. Manufacturer: Ventfabrics, Inc., Durodyne, Dynair, Ductmate Pro Flex.

2.7 DAMPERS

- A. Provide where indicated and required to control flow of air and balance system.
- B. Round dampers shall be single blade, molded synthetic bearings at each end, 20 gauge galvanized steel, adjusting quadrant and locking device. Round dampers shall be Ruskin Model MDRS25.
- C. Rectangular and square dampers shall be opposed blade within 16 gauge galvanized steel channel frame with corner brace, 16 gauge galvanized steel blades; molded synthetic bearings and hex steel shafts, exposed or concealed linkage, adjustable quadrant and locking device. Dampers shall be Ruskin Model MD35.
- D. Approved Manufacturers: Ruskin, Arrow, Nailor-Hart, Pottorff, Lloyd Industries, Inc., Cesco Products, Louvers & Dampers.

2.8 FIRE DAMPERS

- A. Fabricate in accordance with NFPA 90A and UL 555.
 - 1. Ceiling Dampers: Galvanized steel, 22 gauge frame and 16 gauge flap, two layers 0.125 inch ceramic fiber on top side with locking clip.
 - 2. Horizontal Dampers: Galvanized steel, 22 gauge frame, stainless steel closure spring, and lightweight, heat retardant, non-asbestos fabric blanket.
 - 3. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for 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.
 - 4. Multiple Blade Dampers: 16 gauge 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.

5. Fusible Links: UL 33, separate at 160 deg. F with adjustable link straps for combination fire/balancing dampers.
- B. Fire dampers of the applicable rating shall be provided at all locations where ductwork penetrates fire-rated walls, ceilings, or floors. Refer to Architectural Drawings.
- C. Manufacturers: Air Balance, Inc., Ruskin, Louvers & Dampers, Prefco, Phillips-Aire, Metalaire, Pottorff, Lloyd Industries, Inc., Cesco Products, Greenheck.

2.9 AIR DIFFUSERS, REGISTERS AND GRILLES

- A. Air diffusing terminals shall be provided in duct runs on drawings. The diffusers shall properly and uniformly distribute the design air quantity with no objectionable drafts, while maintaining not more than 50 F. P. M. velocity in the occupied portion of the space.
- B. Ceiling Diffusers:
 1. Square Louvered Diffuser Face:
 - a. Square housing, welded steel construction core of square concentric louvers, removable at face of diffuser, round duct connection, with borders suitable for lay-in ceiling tile application.
 - b. Diffuser Patterns: Fixed louver face for 1, 2, 3, or 4 direction air flow, direction indicated on drawings. Each diffuser shall be provided with adjustable control grids.
 - c. Finish: Matte white finish.
 - d. Manufacturers: Price Model SMD.
 2. Linear Diffusers:
 - a. Linear diffusers shall be horizontal continuous slot type with multiple slots per the schedule and drawings. Construction shall be extruded aluminum with 1/2", 3/4" or 1 " slots. The diffusers shall have integral devices to equalize air flow over the entire length of the diffuser.
 - b. Multiple sections of diffusers shall be installed in a continuous arrangement, the butt ends shall be provided without flanges to provide a continuous effect. Multiple sections shall be aligned and fastened with alignment pins and slots or a similar method.
 - c. Linear diffusers shall be provided with adjustable vanes to provide horizontal, vertical or midway patterns of air diffusion. Finish as selected by Architect.
- C. Registers & Grilles:
 1. Registers and grilles shall be steel construction, fixed single deflection type, with clips and/or flange holes and screws (as required by Architectural finishes) to secure registers

to ceiling construction. Face bars shall be inclined 30 degrees. Registers and grilles shall be factory primed and painted with a baked-on white enamel finish.

2. Ceiling Return Register(CR):

- a. Ceiling registers shall have a perforated face with 3/16-inch diameter holes on 1/4-inch staggered centers and no less than 51 percent free area. Perforated face shall be aluminum according to the model selected. The back pan shall be one piece stamped heavy gauge steel of the sizes and mounting types shown on the plans and outlet schedule.
- b. The finish shall be #26 white. The finish shall be a baked on anodic acrylic paint, with a pencil hardness of HB to H. Inside of back pan shall be painted flat black.
- c. Price Model: PDDR

3. Return and Exhaust Grilles (RG & EG):

- a. Grilles shall be available parallel to the long dimension of the grille. Construction shall be of steel with a 1/4 inch wide border on all sides. Screw holes shall be countersunk for a neat appearance. Corners shall be welded with full penetration resistance welds.
- b. Deflection blades shall be firmly held in place by mullions from behind the grille and fixed to the grille by welding in place. Blade deflection angle shall be available at 35°.
- c. The finish shall be #26 white. The finish shall be a baked on anodic acrylic paint, with a pencil hardness of HB to H.
- d. Price model: 535 (RG & EG)

D. Manufacturers: Provide diffusers, registers and grilles of one of the following:

Anemostat	Price
Carnes Co.	Titus
Krueger	Metalaire
Tuttle & Bailey	Nailor Industries

2.10 SOUND ATTENUATION

- A. Provide silencers of the types and sizes shown on plans.
- B. Materials and Construction:
 - 1. Outer casings of rectangular silencers shall be made of 22 gauge galvanized steel in accordance with ASHRAE Guide recommended construction for high pressure rectangular duct work. Seams shall be lock formed and mastic filled.
 - 2. Outer casings of tubular silencers shall be made of galvanized steel.

3. Interior partitions for rectangular silencers shall be made of not less than 26 gauge galvanized perforated steel.
4. Interior construction of tubular silencers shall be compatible with the outside casings.
5. Filler material shall be of inorganic mineral or glass fiber of a density sufficient to obtain the specified acoustic performance and be packed under not less than 5 % compression to eliminate voids due to vibration and settling. Material shall be inert, vermin and moisture-proof.
6. Combustion rating for the silencer acoustic fill shall be not less than the following when tested in accordance with ASTM-E-84, NFPA Standard 255 or UL No. 723:

Flamespread Classification	25
Smoke Development Rating	15
Fuel Contribution	20

7. Airtight construction shall be provided by use of a duct sealing compound on the job site. Material and labor furnished by contractor. Silencers shall not fail structurally when subjected to a differential air pressure of 8 in. w .g. inside to outside of casing.
- C. Acoustic Performance: Silencer ratings shall be determined in a duct- to-reverberant room test facility which provides for airflow in both directions through the test silencer in accordance with ASTM Specification E-477. The test set-up and procedure shall be such that all effects due to end reflection, directivity, flanking transmission, standing waves and test chamber sound absorption are eliminated. Acoustic ratings shall include Dynamic Insertion Loss (DIL) and Self- Noise (SN) Power Levels both for Forward Flow (air and noise in same direction) and Reverse Flow (air and noise in opposite directions) with airflow of at least 2000 fpm entering face velocity.
- D. Aerodynamic Performance: Silencer shall be of the low static pressure loss type. Airflow measurements shall be made in accordance with ASTM specification E-477 and applicable portions of ASME, AMCA and ADC airflow test codes. Tests shall be reported on the identical units for which acoustic data is presented.
- E. Certification: With submittals, the manufacturer shall supply certified test data on Dynamic Insertion Loss, Self-Noise Power Levels, and Aerodynamic Performance for Reverse and Forward Flow test conditions. Test data shall be for a standard product. All rating tests shall be conducted in the same facility, shall utilize the same silencer, and shall be open to inspection upon request from the Architect/Engineer.
- F. Manufacturers: Industrial Acoustics Co., Rink, Commercial Acoustics, Dynasonics, BRD, Price, Vibro-Acoustics.

PART 3 – EXECUTION

3.1 DUCTWORK

- A. Dimensions on drawings are inside dimensions. Sheet metal dimensions shall be increased to suit thickness of acoustic duct lining, if applicable. Interior ductwork that is lined with acoustic lining is not insulated. Exterior lined ductwork is also insulated.
- B. Ducts shall be concealed unless otherwise indicated.
- C. Changes in direction shall be made with radius bends or turning vanes.
- D. Supports shall be galvanized steel.
- E. Locate ceiling air diffusers, registers, and grilles on "Reflected Ceiling Plans". Unless otherwise indicated, locate units in center of acoustical ceiling modules.
- F. Do not install ductwork directly above any electrical equipment.
- G. Ductwork shall be supported per SMACNA Standards except as follows:
 - 1. Rivet or screw to side of duct when using flat strap hangers. Rivet or screw to bottom of duct when using trapeze hangers.
 - 2. Extend hangers down the side of the duct at least 9"; pass hangers under ducts less than 9" deep.
 - 3. Space hangers not more than 8' on centers for ducts up to 18" wide and 4' on centers for ducts over 18" wide.
 - 4. Wire hangers are not acceptable.
 - 5. Support ductwork from building structure with expansion bolts, rods, steel angles or channels installed to meet existing or new building conditions.
 - 6. Drilling into the roof deck is not permitted.
 - 7. Driving nails into anchors is not permitted.
- H. Air Flow Control:
 - 1. Major take-offs: Install volume control dampers.
 - 2. Branches: Install volume control dampers in all branches and at tap in branch take-off connections.
 - 3. Elbows: Use unvaned elbows with throat radius equal to width of duct and full heel radius; provide turning vanes where full throat and heel radius are not possible.

4. Transitions: Make transitions in ducts as required by structural or architectural interferences.
 - a. Proportion airways to compensate for any obstructions within duct.
 - b. Avoid dead ends and abrupt angles.
 - c. Do not exceed 15 degrees slope on sides of transitions.
- I. For all exterior single wall, square or rectangular ductwork, ensure that the top of all horizontal ductwork is crowned to minimize accumulation of weather on top of the finished insulation system jacket specified in Section 15230.

3.2 FLEXIBLE AIR DUCT

- A. When flexible duct is used for final connection between duct mains on branches and diffusers on registers. The maximum length of flexible ductwork shall be 5'-0" in length.
- B. Flexible ductwork shall be properly hung at the tap collar in order to prevent eventual wear and damage to the flexible duct.
- C. The ceiling tile system should not be considered a support on which to lay flexible duct. Refer to SMACNA Standards for proper installation.

3.3 DUCT SYSTEM LEAK SEALING

- A. Joints in duct systems at duct heaters, air monitors, fire dampers, sound traps, supply air terminals including air handling light fixtures, shall be sealed to prevent air leakage.
- B. All duct joints and seams in medium pressure and high pressure duct systems shall be sealed to SMACNA Seal Class "A" Standards to prevent air leakage.
- C. In the event there is in excess of 5% air leakage indicated in low pressure duct systems, it shall be the Contractors responsibility to seal the duct system. The amount of sealing necessary shall be that required to obtain the design air quantity at each terminal.
- D. Duct sealing shall be by means of high velocity duct sealants such as Hardcast and/or Neoprene gaskets. Type of sealant and method of application shall conform to recommendations in SMACNA high velocity duct construction standards.

3.4 DUCTWORK TESTING

- A. The following ductwork shall be pressure leak tested:
 1. Supply ductwork
 2. Return ductwork
 3. Exhaust ductwork
 4. Outside air intake ductwork
- B. All tests shall be conducted in accordance with AABC National Standards.
- C. Ducts to be tested at 100% maximum of static pressure before any duct is insulated externally and concealed in accordance with SMACNA Standards.

- D. Calculate the allowable leakage using leakage factor of 5% of Design Air Flow.
- E. Select a limited section of duct for which the estimated leakage will not exceed capacity of the test apparatus.
- F. Connect the blower and flow meter to the duct section and provide temporary seals at all openings of the ductwork.
- G. Start the blower motor with the inlet damper closed. Increase pressure until the required level is reached.
- H. Read the flow meter and compare the leakage in cfm. Reading should be 5% or less of design flow for the duct segment being tested.
- I. If reading is more than 5% of design flow, depressurize duct, repair all leaks and retest until 5% or less of design flow is obtained.
- J. Complete test reports and obtain Owner's witness signature.
- K. Remove all temporary blanks and seals.
- L. Warning: Do not overpressure duct.

3.5 EQUIPMENT

- A. Test apparatus shall consist of an airflow measuring device, flow producing unit, pressure indicating devices and accessories necessary to connect the metering system to the test specimen.
- B. The Contractor conducting tests shall arrange for or provide all temporary services, all test apparatus, all temporary seals and all qualified personnel necessary to conduct the specified testing.
- C. Test apparatus shall be accurate within plus or minus 7.5% at the indicated flow rate and test pressure and shall have calibration data or a certificate signifying manufacture of the meter in conformance with the ASME Requirements for Fluid Meters. Verification of above to be supplied to Owner upon request.
- D. Pressure differential sensing instruments shall be readable to 0.05" scale division for flow rates below 10 cfm or below 0.5" w.g. differential. For flows greater than 10 cfm scale divisions of 0.1" are appropriate. U-tube manometers should not be used for reading less than 1" of water.
- E. Liquid for manometers shall have a specific gravity of 1 (as water) unless the scale is calibrated to read in inches of water contingent on use of a liquid of another specific gravity, in which case the associated gauge fluid must be used.
- F. Instruments must be adjusted to zero reading before pressure is applied.

3.6 TEST REPORT

- A. Log the project and system identification data.
- B. Enter the fan CFM, the test pressure, and the leakage class specified by the designer.
- C. Enter an identification for each duct segment to be tested.
- D. Calculate the allowable leakage factor. Enter this number on the report for each test segment.
- E. Conduct and record the field tests. If the sum of the CFM measured is less than or equal to the sum of the allowable leakage, the test is passed. Record the date(s), presence of witnesses and flow meter characteristics.
- F. Maintain a mechanical duct plan of all tested duct segments. Plan to include duct segment identification and dates tested.
- G. Test reports shall be submitted as required by the project documents.

3.7 LABELING

- A. At all fire damper, smoke damper and combination fire/smoke damper locations, access doors in ductwork shall be identified with a permanent placard of red-white-red laminated commercial grade plastic construction, minimum one-half inch high capital letters, reading, "FIRE DAMPER", "SMOKE DAMPER", "FIRE/SMOKE DAMPER" as appropriate for the installation. Attach securely to face of access door with brass screws at each corner, sealed airtight.

END OF SECTION 23 06 00

SECTION 23 06 05

FANS

PART 1 – GENERAL

1.1 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 Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

1.2 DESCRIPTION OF WORK

- A. This Section includes labor, material, equipment and supervision to provide a complete air distribution system as specified herein and as shown on drawings.
 - 1. Recessed Ceiling Fan
 - 2. Roof-Mounted Exhaust Fans

1.3 REFERENCE STANDARDS

- A. Refer to Section 230200 for a general description of requirements applying to this section.
- B. Requirements established within the portions of the Project Manual titled Division 1, General Requirements, are collectively applicable to the work of this section.
- C. IMC (International Mechanical Code)
- D. SMACNA (Sheet Metal and Air Conditioning Contractors National Association, Inc.)
- E. American Society of Heating, Refrigerating and Air Conditioning Engineers' recommendations in ASHRAE Guide shall apply to this work.
- F. UL (Underwriter's Laboratories, Inc.)
- G. NFPA 90A shall apply to this work.
- H. State Fire Prevention Regulations.

1.4 QUALITY ASSURANCE

- A. Refer to Section 230210 for a general description of requirements applying to this Section.

- B. Whenever a variable frequency PWM drive is installed to control an AC motor, a maintenance-free, circumferential, conductive micro fiber shaft grounding ring shall be installed on the AC motor drive end to discharge shaft currents to ground. Recommended part: AEGIS SGR™ Bearing Protection Ring, as made by Electro Static Technology. Install in accordance with the manufacturer's written instructions.

1.5 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 230200.
- B. Submit the following:
 - 1. Shop drawings of all sheet metal. Indicate all steel, piping, conduit, and Architectural/Structural features to demonstrate complete coordination. Scale shall not be less than 1/4" = 1'-0".
 - 2. Manufacturer's literature and performance data of all equipment and devices.

1.6 SUBSTITUTIONS

- A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents and as described within the specifications. This shall include, but shall not be limited to space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, they shall be responsible for any and all additional costs associated with the changes required by other trades.

1.7 WARRANTY/GUARANTEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements.

PART 2 – PRODUCTS

2.1 RECESSED CEILING FAN

- A. Ceiling fan shall consist of a rectangular steel cabinet enclosing a true centrifugal fan directly driven by an electric motor.
- B. Cabinet shall be complete with inlet and discharge collar equipped with a backdraft damper, metal or plastic, gravity or spring return.
- C. Motor and fan shall be conveniently removable with plug-in power chord.
- D. The casing shall be sound attenuated, with minimum ½” thick acoustic lining.
- E. Provide electronic speed controller & isolator package, as scheduled on the drawings.

- F. Unit shall be AMCA certified.
- G. Manufacturers: Loren-Cook, Penn Ventilator, Acme, Carnes, Greenheck, Breidert, Panasonic.

2.2 ROOF-MOUNTED EXHAUST FANS

- A. Aluminum casing shall be heavy gauge, mill finish of spun construction, weatherproof, removable, with aluminum birdscreen.
- B. Aluminum centrifugal fan, adjustable V-belt drive selected for 150% of motor ampere rating.
- C. Fans shall be quiet operating, selected for sound level below that of the space ventilated.
- D. Accessories: Disconnect switch, insulated roof curb and belt tensioner.
- E. Manufacturers: Penn Ventilator Co., Greenheck, Loren Cook, Acme, Carnes, Breidert, Hartzell.

PART 3 – EXECUTION

3.1 FANS, EQUIPMENT AND ACCESSORIES

- A. Install in accordance with manufacturer's details and instructions.
- B. Mount fan speed control at the fan to facilitate mechanical balancing. Power wiring shall be part of the work of Division 26.
- C. Perform field mechanical balancing in accordance with Section 230950: TESTING AND BALANCING OF MECHANICAL SYSTEMS.
- D. Install units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
- E. Support: Install and secure roof curb structure, in accordance with National Roofing Contractor's Association (NRCA) installation recommendations and shop drawings. Install and secure units on curbs and coordinate roof penetrations and flashing.
- F. The Mechanical Contractor shall own as a part of his work, the following:

Provide one (1) additional drive set, if necessary, to obtain final design balancing requirements. The Mechanical Contractor shall coordinate with Balancing Firm and equipment manufacturer for drive selection, including belts and pulleys.

END OF SECTION 23 06 05

SECTION 23 07 25

TERMINAL HEATING UNITS

PART 1 – GENERAL

1.1 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 Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

1.2 DESCRIPTION OF WORK

- A. This Section includes work necessary and/or required and materials and equipment for construction of a complete system. Such work includes, but is not limited to the following:
 - 1. Unit Heaters
 - 2. Cabinet Heaters

1.3 REFERENCE STANDARDS

- A. Refer to Section 230200 for a general description of requirements applying to this section.

1.4 QUALITY ASSURANCE

- A. Refer to Section 230210 for a general description of requirements applying to this Section.

1.5 SUBMITTALS

- A. Submit shop drawings in accordance with Section 230200.
- B. Submit shop drawings and descriptive data for all equipment specified in this section.

1.6 SUBSTITUTIONS

- A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but not limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, this Contractor shall be responsible for any and all additional costs associated with the changes required by other trades.

1.7 WARRANTY/GUARANTEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements.

PART 2 – PRODUCTS

2.1 UNIT HEATERS

- A. Propeller type, direct drive, resilient-mounted motor, arranged for vertical or horizontal discharge, double-deflection louvers.
- B. Tested at 400 psig hydrostatic and 200 psig air under water.
- C. Enclosure shall be steel, cleaned, phosphated, primed and finished in baked enamel.
- D. Manufacturers: Airtherm Manufacturing Co., American Air Filter, Embassy Industries, McQuay, Modine, Rittling, Sterling, Trane, Vulcan.

2.2 CABINET HEATERS

- A. Provide cabinet heaters including chassis, heating elements, fans, motor and insulation.
- B. Chassis: Galvanized steel wraparound structural frame with edges flanged.
- C. Insulation: Faced, heavy density glass fiber.
- D. Cabinet: Vertical semi-recessed/recessed/surface-mounted model as scheduled on the drawings, 16 gauge four sided overlap front panel with stiffeners. Clean cabinet parts, bonderize, phosphatize, and flow-coat with baked-on primer.
- E. Coils: Aluminum fins, copper tubes, mechanically expanded for a permanent bond. Provide manual air vent.
- F. Grilles: Intake and outlet grilles shall be integral, stamped 15 degrees deflection.
- G. Fans: Provide direct drive centrifugal, forward curved double width fan.
- H. Motors: Provide two-speed permanent split capacitor type motors (or variable speed) with integral overload protection and motor cords for plug-in to junction box in unit.
- I. Provide HI/LO/OFF fan control (concealed).
- J. Manufacturers: Airtherm Manufacturing Co., American Air Filter, Embassy Industries, McQuay, Modine, Rittling, Sterling, Trane, Vulcan.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF UNIT HEATERS

- A. Install heaters in accordance with manufacturer's installation instructions.
- B. Uncrate units and inspect for damage. Verify that nameplate data corresponds with unit designation.
- C. Hang unit from building substrate.
- D. Protect units with protective covers during balance of construction.

3.3 INSTALLATION OF CABINET HEATERS

- A. Install cabinet heaters in accordance with manufacturer's installation instructions.
- B. Locate cabinet heaters as shown on the drawings. Coordinate with other trades.
- C. Protect units with protective covers during balance of construction.

END OF SECTION 23 07 25

SECTION 23 07 60

AIR HANDLING EQUIPMENT

PART 1 – GENERAL

1.1 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 Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

1.2 DESCRIPTION OF WORK

- A. This Section includes work necessary and/or required and materials and equipment for construction of a complete system. Such work includes, but is not limited to the following:
 - 1. Packaged Rooftop HVAC Unit with Energy Recovery
 - 2. Single Packaged, Gas-Fired Rooftop Air Conditioning Unit

1.3 REFERENCE STANDARDS

- A. Refer to Section 230200 for a general description of requirements applying to this section.
- B. AMCA Standards 210 and 300 for fans.
- C. ARI Standard 410, ASHRAE Standard 33 for Heating and Cooling Coils.
- D. ASHRAE Standard 52.2 and U.L. Standard 900 for media type air filters.
- E. AMCA Standard 511 and 500D for Air Control Dampers.
- F. AMCA Standard 611 and 610 for air flow measurement stations.
- G. ARI Standard 1060 and ASHRAE Standard 84 for Air-to-Air Energy Recovery Equipment.
- H. ARI Standard 260 and 430 for Air Handling Units.

1.4 QUALITY ASSURANCE

- A. Refer to Section 230210 for a general description of requirements applying to this Section.
- B. Whenever a variable frequency PWM drive is installed to control an AC motor, a maintenance-free, circumferential, conductive micro fiber shaft grounding ring shall be installed on the AC

motor drive end to discharge shaft currents to ground. Recommended part: AEGIS SGR™ Bearing Protection Ring, as made by Electro Static Technology. Install in accordance with the manufacturer's written instructions.

1.5 SUBMITTALS

- A. Submit shop drawings in accordance with Section 230200.
- B. Submit shop drawings and descriptive data for all equipment specified in this section.

1.6 SUBSTITUTIONS

- A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but not limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items provided by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, this Contractor shall be responsible for any and all additional costs associated with the changes required by other trades.

1.7 WARRANTY/GUARANTEE

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements. In addition, the following special guarantee applies:
 - 1. Each compressor unit shall be provided with manufacturer's five (5) year parts and labor warranty.

PART 2 – PRODUCTS

2.1 PACKAGED ROOFTOP HVAC UNIT WITH ENERGY RECOVERY

- A. Factory fabricated and assembled unit consisting of constant volume fans, motors, and drive assemblies, chilled water coils, plenum casing, filters, energy recovery wheel (with motor and drive), natural gas heating section, access doors and operating controls, motor starters and disconnect switches.
 - 1. Unit cooling capacities shall be in accordance with and tested to ARI standard 210/240-84 & 360-85.
 - 2. Units shall be safety certified in accordance with UL standard UL465, UL559 and/or ANSI Standard Z21.47. Unit shall be safety certified by an accredited testing laboratory. Unit nameplate shall carry the sticker of the certification agency.
 - 3. Unit shall be shipped completely assembled by the manufacturer including all standard items and optional items. Unit shall be 100% run tested by the manufacturer with a copy of the run test report shipped with the unit.

4. Unit shall have decals and tags to indicate unit lifting - rigging, service areas and caution areas. Wiring diagrams, installation and maintenance manuals shall be supplied with each unit.

B. Unit Construction:

1. Unit shall be completely factory assembled, piped and wired, and shipped in one piece, specifically designed for outdoor application with a fully weatherproof cabinet with dedicated bottom supply/return air style system for mounting on an insulated extended height curb. Cabinet shall be constructed entirely of G90 galvanized metal with the exterior constructed of 18 gauge or heavier material. The unit roof shall be cross broken and sloped to assure drainage.
2. Access to coils, controls, filters, blower, heating section, and other items shall be through hinged access doors with a quarter turn latch (door fastening screws are not acceptable). Air side service access doors shall be fully gasketed with rain break overhangs. Filter access door will have an internal metal liner to protect the doors insulation.
3. Unit exterior shall be painted with corrosion resistant polyurethane paint over a wash primer and a paint lock type galvanized steel. Paint shall be manufacturer's standard color and withstand a 2,500 hour salt spray test. The interior air side of the cabinet shall be entirely insulated on all exterior panels with 2" thick, 1-1/2 pound density, fiberglass insulation.
4. To guarantee no leakage of conditioned air from the cabinet all of the cabinet under positive pressure, downstream from the supply air blower, shall have a separate internal cabinet contained within, and separate from, the exterior cabinet by an air gap. The internal cabinet shall be guaranteed to hold a static pressure of up to 12 inches water column.
5. All openings through the base pan of the unit shall have turned flanges of at least 1/2" in height around the opening through the base pan.
6. Provide cabinet extensions adjacent to each coil section of sufficient size to accommodate piping, valves and accessories as detailed on the drawings. Cabinet extensions shall be an integral part of the unit and its support curb, equal in construction, with openings down through the roof deck to allow building air to penetrate the compartment.

C. Fans:

1. Blower(s) shall be entirely self contained on a slide deck for service and removal from the cabinet. Adjustable V-belt drive shall be provided with a minimum rating of 140% of the motor nameplate brake horsepower. Blowers, drives and motors shall be statically and dynamically balanced. Blower shall be single width, single inlet airfoil design.
 - a. Blower shall be controlled by a factory mounted VFD where indicated.
2. Shafts shall be AISI hot rolled steel accurately turned, ground, polished, and ring gauged for accuracy. Shafts shall be sized for first critical speed of at least 1.43 times the maximum speed for the class.

3. Bearings shall be heavy duty, grease lubricated, anti-friction ball or roller, self-aligning, pillow block type and selected for minimum average bearing life (AFBMA L-50) in excess of 200,000 hours at the maximum class RPM.
4. Fans shall be mounted on vibration bases with adjustable motor bases, V-belt drives, spring isolators, and flexible connections. Belts shall be designed for a minimum 1.4 service factor. Drives for motors shall be variable pitch.
5. Motors shall be standard NEMA frame, high efficiency, with 1.15 service factor and open drip-proof enclosures. Motor selections shall be non-overloading over the fan curve from 0 to 150% of design flow, and the design BHP shall not be above 90% of motor horsepower at design condition.
6. Fans' ratings shall be based on AMCA Standards 210 and 300. Fans shall bear the AMCA seal.

D. Outside Air Economizer

1. Shall be a modulating enthalpy controlled economizer with multi-stage integrated economizer for maximum benefit. The economizer shall consist of a motor operated outdoor air damper and return air damper constructed of extruded aluminum, hollow core, air foil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 25 CFM of leakage per square foot of damper area when subjected to 2" WG air pressure differential across the damper. Damper motor shall be spring return to insure closing of outdoor air damper during periods of unit shut down or power failure.
2. CO₂ Controls: Unit shall be equipped with CO₂ sensors to modulate outside air. The economizer shall consist of a motor-operated outdoor air damper and return air damper constructed of extruded aluminum, hollow core, air foil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 25 CFM of leakage per square foot of damper area when subjected to 2" WG air pressure differential across the damper. Damper motor shall be spring return to ensure closing of outdoor air damper during periods of unit shutdown or power failure.

E. Energy Recovery Wheel:

1. Units shall be furnished with a factory mounted and tested energy wheel. The wheel shall be mounted in a rigid frame containing the wheel drive motor, drive belt, wheel seals and bearings. These components will form a cassette which shall be removable from the unit without the use of tools.
2. The energy recovery cassette shall contain a total energy recovery heat wheel constructed of a light weight polymer material with permanently bonded desiccant coating. The energy recovery wheel media shall be capable of removal from the cassette and replacement without the use of tools. Wheel media shall be cleanable using hot water or light detergent without degrading the latent efficiency.

3. The exhaust fan shall be forward curved or backward inclined DWDI with an adjustable V-belt drive. A backdraft damper shall be included with the exhaust fan.
4. The energy wheel section shall include a through-matrix purge section factory installed onto the energy wheel. The purge section shall include dampers, actuators and casing components.
5. The energy recovery wheel shall include wheel rotation detection sensor and speed switch output module with contacts wired to the low voltage terminal block for wheel rotation indication.

F. Gas Heating Section:

1. Unit shall be equipped with a fully modulating heating section using natural gas fuel, minimum 4 to 1 turndown.
2. Unit shall be provided with a gas heating furnace consisting of an aluminized steel or stainless steel tubular heat exchanger, an induced draft blower, and an electric pressure switch to lock out the gas valve until the combustion chamber is purged and combustion air flow is established.
3. Unit shall be provided with a gas ignition system consisting of an electronic ignitor to a pilot system, which will be continuous when the heater is operating, but will shut off the pilot when heating is not required.
4. Unit shall have gas supply piping entrances in the unit base for through the curb gas piping and in the outside cabinet wall for across the roof gas piping.
5. Units tubular heat exchanger shall carry a twenty-five (25) year warranty.

G. Chilled Water Coil:

1. Chilled water coil(s) shall be four row copper tube with aluminum fins mechanically bonded to the tubes.
2. Chilled water coils shall have galvanized steel end casings.
3. Chilled water coils shall be 5/8" copper tube.
4. Coil performance certified in accordance with ARI Standard 410.
5. Coils shall be designed to operate at 250 psig.
6. Coils shall be tested at 325 psig.

H. Power/Electrical Section

1. Unit shall be equipped with a single point electrical connection with motor starters, relays,

voltage transformer and terminal block for controls interface, factory mounted disconnect switch.

2. Unit shall include a laminated, color coded electrical wiring diagram attached to the door of the unit. Damper actuators shall be wired to the units low voltage terminal block. All components are UL listed, approved, or classified.

I. Filters

1. Unit shall be furnished with 2", MERV 8, pleated throw away supply air filters, U.L. Class 2.
2. Units with energy recovery wheels shall have outside air and mixed air filter sections.

J. Roof Curbs

1. Curb shall be constructed of 14 gauge galvanized steel with a wood nailer strip. Curbs are to be fully gasketed between the curb top and unit bottom with the curb providing full perimeter support, cross structure support and air seal for the unit. Curb shall have extended height to accommodate horizontal duct penetrations.

K. Manufacturers: Basis of design AAON. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work are limited to one of the following:

1. AAON
2. Addison
3. McQuay
4. Lennox

L. Any listed equivalent manufacturer and the Mechanical Contractor shall be completely responsible to comply with all requirements as indicated on the contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades.

2.2 SINGLE PACKAGED, GAS-FIRED ROOFTOP AIR CONDITIONING UNIT

A. Refrigeration System:

1. Four stage cooling with one independent refrigeration circuit for each hermetic compressor, crankcase heater, strainer, high and low pressure control, compressor motor protection, and access valves.
2. A direct expansion, draw-thru evaporator coil shall be circuited so that its entire fin surface will be active during part load operation.
3. Draw-thru condenser coils with a separate sub-cooling circuit for each refrigeration system shall provide at least 15 F of sub- cooling at design conditions.

4. Outdoor air thermostats shall cycle the condenser fan motors to maintain stable operation at ambient temperature down to 35 deg. F. Condenser fan motors shall have inherent protection.
- B. 100% Outdoor Air (Economizer Package):
1. Outdoor and return air dampers shall be interlocked in position by a fully modulating damper actuator. Actuator shall be spring return so that the outdoor air intake dampers will close when power to the unit is interrupted.
 2. Maximum leakage rate for the outdoor air intake dampers shall not exceed 2% when fully closed and operating against a pressure differential of 0.5"WC.
 3. A unit-mounted potentiometer shall be provided to adjust the outdoor and return air damper assembly to take in minimum scheduled or 10% CFM of outdoor air.
 4. During economizer operation, a mixed air temperature control shall modulate the outdoor and return air damper assembly to prevent the supply air temperature from dropping below 55 deg. F.
 5. Changeover from mechanical refrigeration to economizer operation shall be provided by enthalpy control.
 6. The outdoor intake opening shall be covered with a birdscreen and a rain-hood that matches the exterior of the unit.
 7. Economizer controls shall be BAS ready, factory wired.
- C. Exhaust Air Relief Dampers:
1. Economizer shall be equipped with powered exhaust and a barometric damper that will open to relieve return air as more outdoor air is supplied to the conditioned space during economizer operation. This relief shall prevent the conditioned space from over-pressurizing during economizer operation.
 2. Exhaust air opening shall be covered with a birdscreen and a rain hood that matches the exterior of the unit.
- D. Filters shall be 2" thick replaceable type MERV 7 per ASHRAE Standard 52.2 and internal metal frame work.
- E. A 1,750 rpm single supply air blower motor shall have a 1.15 service factor, solid base, Class B insulation and ball bearings with permanent lubrication. All belts and pulleys shall be treated with permanent lubrication. All belts and pulleys shall be rated at least 25% above the nominal drive horsepower. The fan shaft ball bearings shall have minimum average bearing life (AFBMA L-10) in excess of 100,000 hours at the maximum class RPM.

F. Roof Curb:

1. Roof curb shall be supplied by the unit manufacturer to provide a watertight seal between the roof and the unit.
2. Roof curb shall be approved by the National Roofing Contractor's Association.
3. Roof curb shall be full perimeter with all utility and duct connections within the perimeter of the curb eliminating the need for other roof penetrations.

G. Unit Construction:

1. All sheet metal parts shall be constructed of a zinc coated, commercial grade galvanized steel. All external surfaces shall be finished with a UL approved coating system.
2. Removable side panel shall provide easy access for maintenance, service and adjustment.
3. Unit shall be double wall construction with rigid insulation such that insulation is not exposed to the air stream.
4. Unit shall have lifting lugs on each of the four upper corners.
5. Condenser coils and fan discharge shall be protected by heavy duty wire guards.

H. Basic Safety/Operating Controls - Unit manufacturer shall supply the following safety/operating control features:

1. A thermostat to deenergize the compressors when the suction line temperature drops below 22° F.
2. A five minute timer to prevent the compressor from short cycling.
3. A lock out circuit to prevent the compressors from cycling on one of their safety controls.
4. A cutout to protect the compressors during abnormally low voltage conditions.

I. Unit shall be completely factory wired, piped, charged and tested by the manufacturer before shipment.

J. Gas Heating Section:

1. Manufacturer shall furnish a two-stage, natural gas furnace constructed of 20 gauge aluminized steel tubes.
2. Furnace shall include the following controls and safety devices:
 - a. Intermittent spark ignition with two stage gas valve with pressure regulator.
 - b. Centrifugal blower to maintain positive flue pressure with air pressure safety switch.

- c. Electronic ignition with flame sensor and lockout safety valve.
- d. High temperature limit thermostat with automatic reset.

- K. Manufacturer shall furnish factory mounted and wired control modules for all internal functions. Provide marked terminal strip for interface with building ATC system.

- L. Manufacturer: York/Johnson Controls, Carrier, McQuay, Aaon.

- M. Manufacturer shall furnish start-up.
 - 1. Any listed equivalent manufacturer and the Mechanical Contractor shall be completely responsible to comply with all requirements on the contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.

- B. Install in accordance with manufacturer's recommendations. Unit and all component sections shall be properly supported and vibration isolated.

3.2 INSTALLATION

- A. Verify that coils, filters, motors, drives and other components are matched with the proper unit.

- B. Assemble unit components following manufacturer's instructions for handling, testing and operation. Repair damaged galvanized areas, and paint in accordance with manufacturer's written recommendations.

- C. Vacuum clean interior of units prior to operation.

- D. Repair air leaks from or into casing that can be heard or felt during normal operation.

- E. Install rooftop units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

- F. Support: Install and secure roof curb to roof structure, in accordance with National Roofing Contractor's Association (NRCA) installation recommendations and shop drawings. Install and secure rooftop units on curbs and coordinate roof penetrations and flashing.

- G. Perform field mechanical balancing in accordance with Section 230950: TESTING AND BALANCING OF MECHANICAL SYSTEMS.

H. The Mechanical Contractor shall own as part of his work, the following:

Provide one (1) additional drive set, if necessary, to obtain final design balancing requirements. The Mechanical Contractor shall coordinate with Balancing Firm and equipment manufacturer for drive selection, including belts and pulleys.

END OF SECTION 23 07 60

SECTION 23 09 00

AUTOMATIC TEMPERATURE CONTROL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Section 230200 and drawings are hereby made a part of this section as fully as if repeated herein.
- B. The Mechanical Contractor shall coordinate with the work of Division 26 and the Fire Alarm System vendor for locations and mounting of all duct smoke detectors. These devices are shown on the Mechanical Drawings for reference only to show the intent of the work. All locations shall be determined based on approved shop drawings from the Fire Alarm System vendor and the Contractor for the work of Division 26, Electrical.

1.2 DESCRIPTION OF WORK

- A. Provide labor, material and supervision necessary to install a complete direct digital control system of temperature controls to control all HVAC Systems, associated components and accessories as described herein. Provide an extension of the existing DDC System as manufactured by Building Logix.

1.3 SUBMITTALS

- A. Submit shop drawings and manufacturer's data sheets of all equipment.
- B. Submit manufacturer's certificates of conformance with applicable codes.
- C. Furnish point-to-point diagram of automatic temperature control system approval, including heating, ventilating and air conditioning equipment wiring diagrams where temperature control connections are required.
- D. Provide ten (10) copies of submittal data within thirty (30) days of contract award.
- E. Submittal shall consist of:
 - 1. System Architecture showing all digital and pneumatically actuated devices.
 - 2. Equipment lists of all proposed devices and equipment including data sheets of all products.
 - 3. Valve, damper and well and tap schedules showing size, configuration, capacity and location of all equipment.

4. Data entry forms for initial parameters. Contractor shall provide English listing of all analog points with columnar blanks for high and low warning limits and high and low alarm limits, and a listing of all fan systems with columnar blanks for beginning and end of occupancy periods; and samples of proposed text for points and messages (for at least two systems of at least 15 points total) including sample 480 character alarm message. All text shall be approved prior to data entry.
5. Wiring and piping interconnection diagrams including panel and device power and sources.
6. Sketches of all graphics.

1.4 QUALITY ASSURANCE

- A. Insure that all work and equipment is installed in accordance with manufacturer's warranty requirements.
- B. Provide adequate supervision of labor force to assure that all aspects of specifications are being fulfilled.
- C. The system shall be engineered, programmed and installed by personnel trained and regularly employed by the control's manufacturer.
- D. Supplier shall have technical support to promptly respond within 24 hours or less to service calls to the site with technical staff, spare parts inventory and test and diagnostic equipment.
- E. Codes and Approvals:
 1. The complete system installation shall be in strict accordance with national and local electrical codes. All devices designed for or used in line voltage applications shall be UL listed.
 - a. All microprocessor based devices shall be UL916 listed.
 - b. All electrical environmental control and monitoring devices shall be UL429 and/or UL873 listed.
 2. All electronic equipment shall conform to the requirements of FCC regulation Class B, Part 15, Section 15 governing radio frequency electromagnetic interference and be so labeled.
 3. The complete system shall conform to ANSI/ASHRAE Standard 135.95, BACNET.
- F. All system components shall be designed and built to be fault tolerant.
 1. Provide satisfactory operation without damage at 100% above and 85% below rated voltage and at +3 Hertz variation in line frequency.
 2. Provide static, transient, and short circuit protection on all inputs and outputs. Communication lines shall be protected against incorrect wiring, static transients and induced magnetic interference. Bus connected devices shall be A.C. coupled or equivalent so that any single device failure will not disrupt or halt bus communication.

1.5 ELECTRICAL WIRING

- A. All electrical wiring, components and accessories in connection with the Automatic Temperature Control System shall be furnished and installed by the control manufacturer.
 - 1. Electrical Contractor shall provide all wiring to duct smoke detectors.
 - 2. Unless stated otherwise in the design documents, the ATC Contractor is responsible for providing control power to all valves, actuators, devices and components within the DDC System regardless of the selected voltage of those devices. This also includes all 120 volt power circuits required for devices, panels and control equipment.
 - 3. The ATC Contractor shall be responsible for providing the control interface between terminal unit condensate pumps and their respective units at the required voltage of these devices in order to shut down the terminal unit in the event of high water level in the condensate pump receiver.
- B. Control wiring shall include all wiring necessary to interface with new controls, such as relays and transducers, and shall also include electric and electronic devices such as freezestats, electronic sensors, relays, flow switches and controlled devices such as valve and damper operators, both electric/electronic actuated devices. Pilot devices such as ON/OFF switches and thermostats installed in series with line voltage circuits shall be considered to be control wiring.

1.6 AUTOMATIC TEMPERATURE CONTROL

- A. Provide a DDC System of automatic temperature control. The system shall be complete in all respects including labor, materials, equipment and services necessary.
- B. All electrical wiring in connection with the installation of the automatic temperature control system shall be furnished and installed under the direct supervision of the control manufacturer.

PART 2 – PRODUCTS

2.1 SENSORS

- A. Solid state room sensors shall be of the wire wound resistance type element. Sensor shall be equipped with visual readout and adjustment. Sensors shall be of the completely solid state type with no moving contacts. Printed circuit board under thermostat cover shall contain a low mass resistance type setpoint dial and amplifier. Provide test points for measuring output voltage. Sensors shall be direct or reverse acting as required for the sequence of operation.
- B. Sensors shall provide the application for night setback override.
- C. Sensors shall be mounted at ADA height (48” above floor).

2.2 SMOKE DETECTORS

- A. Duct type ionization smoke detectors shall be furnished by the Electrical Contractor and installed by the Mechanical Contractor in the supply and return air stream. The Electrical Contractor shall provide wiring from each detector to the Fire Alarm System panel.
- B. The Electrical Contractor shall provide an alarm output signal from the FAS panel to the BAS for unit shutdown.

2.3 ACTUATORS

- A. Electronic actuators shall be sized to operate their appropriate dampers and valves with sufficient reserve power to provide smooth modulating action or two-position action as specified.
- B. Provide integral, auxiliary switches for direct coupled actuators to indicate when a desired position is reached or to interface additional controls for a specific sequence.
- C. Align actuator with drive shaft, provide permanent mark to identify closed position of end device.

2.4 SENSOR TRANSMITTERS

- A. Duct and immersion sensors shall have minimum spans as required to meet the temperature requirements. Duct sensors shall have sensing elements of sufficient length and accuracy to measure average duct temperature in each location.
- B. Sensors shall be of corrosion resistant construction, tamperproof, suitable for mounting on a vibrating surface. Exposed capillaries shall be temperature compensated, and armored or installed in protective tubing.
- C. All sensing elements for water pipe mounting shall be of the rod and tube type with linear output and shall be furnished complete with separable protecting wells filled with heat conductive compound. Sensors shall be factory calibrated and tamperproof. If easily adjustable sensors are provided, they shall be located inside metal enclosures with cylinder lock and key to prevent unauthorized setting.
- D. Safety Devices: Provide the following:
 - 1. Low limit, electric type, with 20' long serpentine element, with manual reset, set for 37°F for "freeze" protection and 55°F for fan discharge application, unless otherwise noted.
 - 2. Air and water duty flow switches: Current sensor type for fan and pump status.
 - 3. Carbon dioxide sensor/transducer suitable for wall or duct mounting.
 - a. Analog output of 4 to 20 milliamps corresponding to 0 to 2000 ppm CO₂.
 - b. ABS plastic housing, suitable for an operating environment of 0 to 125 F/ 0 to 100% RH, non-condensing.
 - c. Repeatability less than +/- 20 ppm.
 - d. Response time less than 60 seconds.

- e. Power supply, 24 VAC.
- f. Make: Vaisala Inc. model GMW 21 (wall)
GMD 20 (duct)
- g. Manufacturers: Air Test Technologies, Inc., Macurco, Vaisala, Inc.

2.5 CONTROL VALVES

- A. Valves shall be rated for a minimum of 150 percent (150%) of system operating pressure at the valve location but not less than 125 psig.
- B. 2" and Smaller: Valves shall be bronze body with screwed or flared connections.
- C. 2½ " and Larger: Valves shall be bronze or iron body, flanged.
- D. Flow characteristics:
 - 1. Three-way valves shall have a linear relation of flow vs. valve position.
 - 2. Two-way valve position vs. flow relation shall be equal percentage for water flow control.
- E. Maximum pressure drop through valve:
 - 1. Modulating water flow control: ½ the pressure drop through the apparatus with maximum of 10 feet of water. Two position water valves shall be line size.

2.6 CONTROL DAMPERS

- A. The ATC Sub-contractor shall furnish all the controlled dampers of the type and sizes indicated on the drawings for installation by the sheet metal Sub-contractor.
- B. All 2-position control dampers shall be parallel blade and sized for minimum pressure drop, at the specified duct size.
- C. All modulating dampers shall be opposed blade and sized for an effective linear air flow control characteristics within the angle of rotation and maximum pressure drops specified. Information shall be provided to the sheet metal Subcontractor for determining the proper duct reductions or baffles used.
- D. Damper frames shall not be less than 16 gauge galvanized steel, formed with corner braces for extra strength, with mounting holes for enclosed duct mounting.
- E. All damper blades shall be of not less than 16-gauge galvanized steel formed for strength and high velocity performance. Blades on all dampers must not be over 8" in width. Blades shall be secured to 1/2" diameter zinc plated axles by zinc plated bolts and nuts. All blade bearings shall be nylon or oilite. Blade side edges shall be sealed off against spring stainless steel seals. Teflon coated thrust bearings shall be provided at each end of every blade to minimize torque requirements and insure smooth operation. All blade leakage hardware shall be constructed of corrosion resistant, zinc plated steel and brass.

- F. Dampers shall be suitable for operation between -40 and 200 degrees. The control manufacturer shall submit leakage and flow characteristics plus a size schedule for all controlled dampers.
- G. All blade edges shall have inflatable seal edging that shall be rated for leakage less than 10 cubic feet per minute per square foot of damper area at a differential pressure of 4" of water when the damper is being held by a torque not to exceed 50 inert lbs. Leakage shall not exceed 1/2 of 1% of total flow.
- H. Provide permanent mark or scribe end of drive shaft to align damper with actuator in closed position.

2.7 CONTROL CABINETS

- A. Control cabinets shall be constructed of 18-gauge steel with locking hinged door. Unless otherwise specified, all controllers, electric relays, switches and other equipment furnished as part of the control system which are not required to be mounted on mechanical equipment, shall be cabinet mounted. The temperature indicators and switches shall be flush mounted on the door tagged with plastic labels. All electrical devices shall be wired to a numbered terminal strip and all devices shall be completely adjusted and checked for proper operation prior to shipment to job site. All wiring shall be numbered according to the control diagram.

2.8 SEQUENCE OF OPERATION

- A. Host Computer and Operator's Work Station (OWS)
 - 1. Verify location of the existing host computer and peripheral equipment in the facility office.
 - 2. Coordinate and provide all required capacity and features with the Owner's equipment to accommodate the work of these systems.
 - 3. All control programs and application features shall reside in the OWS.
 - 4. Control manufacturer shall provide subsequent levels of control capability to whatever extent necessary to achieve performance required for individual units in their respective local control panels. Coordinate power requirements with locations of dedicated 120VAC circuits shown on the electrical drawings.
 - 5. Coordinate with the Owner to establish occupied/unoccupied schedules and setpoints. Enter the schedules and setpoints into the system. Provide the required number of input/output points to achieve the specified sequences of operation and monitoring points.
 - 6. Coordinate with the Owner to determine which points shall be trended and the sampling frequency. Set up the trend logs in the BAS.
- B. Auditorium Cooling System Control
 - 1. The BAS shall provide a signal to the required system equipment on a call for chilled water.

- a. The chilled water system consists of a packaged air-cooled chiller unit CH-1, two pumps P-1 and P-2 piped in a lead/lag arrangement, and auxiliaries.
2. The following items shall be available for display at the OWS:
 - a. Graphical display of the system and related piping.
 - b. Global outside air temperature.
 - c. Chilled water system supply and return temperatures.
 - d. Equipment status/alarms.

3. Chilled Water System Control:

This system shall be activated and controlled by the OWS. Once activated, and subject to a flow switch in the leaving water line at the evaporator, the chiller shall start and sequence through its factory controls to maintain leaving water temperature at 42°F, adjustable.

The following items shall be available for display at the OWS:

- a. Graphical display of the chiller, pumps, piping layout and temperature control devices with dynamic display of each status, temperature, etc.
 - b. Chilled water discharge and return temperature.
 - c. Up to 3 alarms/status points for the chiller.
 - d. Chilled water discharge temperature reset.
 - e. Chiller on/off command.
4. Loop Pumps Control:

The loop pumps shall be controlled directly by the OWS. Rotate lead pump on a minimum weekly basis or as reset manually at the OWS. Lead loop pump shall start and run continuously when the cooling system is activated by the OWS. When lead pump fails to start once activated, initiate an alarm to the system after a twenty second delay. Monitor flow status of each pump with a current sensor on one leg of power feeding the pump motor.

The following items shall be available for display at the OWS:

- a. Designated lead and lag pump.
- b. Flow status/alarm.
- c. Commanded status of each pump – on/off.
- d. Loop discharge and return temperature.
- e. Diagram showing the layout of the equipment with major components and dynamic temperatures shown where temperature sensors exist in the system.

C.1 Unit Heater Control

1. The sequence that follows is typical for units: UH-1, UH-2, and UH-3.
2. Provide a flat plate temperature sensor in the Paint Storage Room and a wall mounted temperature sensor with guard in the Scene Shop as shown on the drawings.

3. On a fall in space temperature below 68°F, adjustable, room sensor shall energize the fan on each unit heater. On a rise in space temperature, the reverse shall occur.
4. Sensor shall activate units UH-2 and UH-3 to operate in unison.
5. The following items shall be displayed at the OWS:
 - a. Space temperature.
 - b. Low temperature alarm, 40°F, adjustable.
 - c. Heating setpoint.
 - d. Commanded status of unit heater fan.

C.2 Cabinet Unit Heater Control:

1. The sequence that follows is typical for CUH-1.
2. Provide a two way control valve and actuator.
3. Provide blank plate, wall mounted temperature sensor as shown on the drawings.
4. Sensor shall open control valve to maintain space temperature at 68°F, adjustable.

D. Ductless Split System Cooling Unit Control:

1. This sequence is for system AC-1/ACC-2 which serves Storage Room 243.
2. The system shall be controlled by its factory controls. Mount and wire the thermostat, which is furnished by the equipment manufacturer, and interlock the controls from the indoor unit to the outdoor unit. Set to maintain 75°F, adjustable.
3. Provide a wall mounted temperature sensor for monitoring and alarm generation at the OWS. On a rise in space temperature above the programmed high limit setpoint of 80°F, adjustable, an alarm shall be activated.
4. The following items shall be displayed at the OWS:
 - a. Space temperature.
 - b. High limit alarm and setpoint.

E. Ductless Split System Heat Pump Unit Control:

1. This sequence is typical for the following systems.
 - a. Dimmer Room: HP-1 and HP-2/ACC-1.
 - b. Scene Shop: HP-3 and HP-4/ACC-3.
 - c. Ticket Room and Lighting Booth: HP-5 and HP-6/ACC-4.
2. Each unit shall be controlled by its factory controls. Mount and wire the thermostat, which is furnished by the equipment manufacturer, and interlock the controls from the indoor units to the outdoor unit. Set to maintain 75°F, adjustable.

3. Provide a wall mounted temperature sensor for monitoring and alarm generation at the OWS. On a rise in space temperature above the programmed high limit setpoint of 80°F, adjustable, an alarm shall be activated. On a fall in space temperature below the programmed low limit setpoint of 50°F, adjustable, an alarm shall be activated.
 4. The following items shall be displayed at the OWS:
 - a. Space temperature.
 - b. High and low limit alarms and setpoints.
- F. Paint Shop Exhaust Fan Control
1. The sequence that follows is for unit EF-1.
 2. The exhaust fan shall be energized manually by a wall mounted switch provided as part of the work of Division 26 – Electric. When the fan is activated its integral backdraft damper shall open and the fan shall run continuously.
 3. Interface with a common fire alarm input to the BAS from the fire alarm system (FAS). When the FAS indicates an alarm condition, the BAS shall de-energize the fan.
- G. Stage Exhaust Fan Control
1. The sequence that follows is for EF-2.
 2. The exhaust fan shall be energized during the occupied period and de-energized during the unoccupied period via the BAS. The exhaust damper shall be open during the occupied mode and shall be closed during the unoccupied mode.
 3. Provide motor operated damper and actuator for the exhaust fan as shown on the drawings. The damper shall be installed by the Mechanical Contractor.
 4. Subject to a limit switch on the exhaust air damper, the fan shall run continuously during the occupied mode.
 5. Provide a current sensor on one phase of power feeding the fan for status indication at the OWS. Provide an alarm if the fan is commanded on and flow is not proven after a 20-second delay.
 6. Interface with a common fire alarm input to the BAS from the fire alarm system (FAS). When the FAS indicates an alarm condition, the BAS shall de-energize the fan and close the exhaust air damper.
 7. The following items shall be displayed at the OWS:
 - a. Fan status via current sensor: on/off/alarm.
 - b. Commanded status of fan and damper.

H. Packaged Rooftop Unit Control: Stage

1. Each packaged rooftop unit RTU-1 and RTU-2 consists of a supply fan, packaged air-cooled DX cooling system, gas fired heating section, air filters, air control dampers and actuators, and unit controls.
 - a. Each unit is a constant volume system with minimum outside air and economizer mode of operation.
 - b. Each unit shall be controlled by an individual DDC Controller. The DDC Controller shall be wired to sensors which shall include, but are not limited to, a discharge air temperature sensor, mixed air temperature sensor, return air temperature sensor, return air humidity sensor, global outside air temperature/humidity/enthalpy, and space temperature sensors.
2. The following items shall be provided by the equipment manufacturer:
 - a. Motor starters and overload protection.
 - b. Control transformers.
 - c. Dampers and damper motors.
 - d. Terminal blocks for all wiring connections between equipment and control devices.
 - e. Standard factory control modules for all unit functions.

The following items shall be provided by ATC.

- a. Discharge air temperature sensor.
 - b. Return air temperature and humidity sensors.
 - c. Global outside air temperature and humidity sensors.
 - d. Current sensor for one phase of the power feeding the fan.
 - e. Mixed air average temperature sensor.
 - f. Space temperature sensors.
 - g. DDC Controller.
3. During the programmed occupied mode, the supply fan shall run continuously with the outside air damper closed. When fan fails to start once activated, initiate an alarm to the system after a twenty second delay. Monitor fan status with a current sensor on one leg of power feeding the fan motor. Delay opening the outside air damper to its minimum position until the zone space temperature has recovered from the setback or setup temperature setting. The return air and relief air dampers in the unit shall modulate in unison to maintain the balance of air in the system.
4. On a drop in space air temperature below the programmed setpoint of 70°F, the unit gas heating section shall be activated through its unit controls and stage to maintain setpoint.
5. On a rise in space air temperature above setpoint, the mixing box economizer sequence shall be activated. On a further rise or if the economizer sequence is deactivated, the unit air-cooled DX system shall be activated through its unit controls to maintain setpoint. On a fall in temperature the reverse shall occur. Maintain 75°F, adjustable.

6. The mixing box economizer sequence shall be activated as the first stage of cooling. The DDC Controller shall receive input from the global outside air temperature and humidity sensors to calculate outside air enthalpy. If the outside air enthalpy is at 21 BTU/lb, the mixing box dampers shall modulate to maintain the mixed air temperature setpoint of 55°F, adjustable. The outside air damper shall continue to open up to 100% outside air to satisfy cooling demand. At this point, the unit exhaust fan shall start. The return/relief dampers in the unit shall move in unison to maintain the balance of air in the unit. The outside air damper shall not close below the minimum position during the occupied period.
 7. During the programmed un-occupied mode, the fan, heating, cooling and mixing box dampers shall be cycled/modulated to maintain the un-occupied setpoints of 60°F (heating) and 85°F (cooling), all adjustable. Unless required for economizer cycle, the outside air and relief air dampers shall remain closed with the return air damper fully open.
 8. Interface with a common fire alarm input from the fire alarm system. The fire alarm contact shall be provided at the fire alarm panel by the Contractor for Division 26 - Electric. The status of the alarm contact shall be communicated throughout the BAS. When the fire alarm contact indicates an alarm condition, the BAS shall de-energize the unit. When de-energized, the damper motor shall spring return the outside and relief air dampers closed. Provide an alarm at the OWS to indicate fire alarm status.
 9. The Mechanical Contractor shall install duct smoke detectors in the supply and return air ducts at the unit as furnished by the Contractor for Division 26 - Electric. When wired to the fire alarm system, the duct smoke detectors shall alarm the FAS. When the fire alarm contact indicates an alarm condition, the BAS shall de-energize the unit. When de-energized, the damper motor shall spring return the outside and relief air dampers closed.
 10. The following items shall be displayed at the OWS:
 - a. Average space temperature.
 - b. Average space temperature setpoint.
 - c. Mixed air temperature.
 - d. Mixed air temperature setpoint.
 - e. Global outside air temperature, humidity and enthalpy.
 - f. Fire alarm system status/alarm.
 - g. Duct smoke detectors status: normal/alarm.
 - h. Commanded status of fan.
 - i. Supply fan operational status via current sensor.
 - j. Diagram showing the layout of the equipment with major components and dynamic temperatures shown where temperature sensors exist in the system.
- I. Packaged Rooftop Unit Control: Auditorium
1. The sequence that follows is for unit RTU-3. The unit consists of a supply fan, exhaust fan, variable frequency drives for each fan, energy recovery wheel and drive, chilled water cooling coil, gas heating section, air filters, and air control dampers for return air, outside air and exhaust air. The outside air damper shall include flow monitor and transmitter.

- a. The unit is a constant volume system with variable outside air and CO₂ mode of operation.
 - b. Provide the unit with an individual DDC Controller. The DDC Controller shall be wired to sensors which shall include, but are not limited to, a discharge air temperature sensor, mixed air temperature sensor, return air temperature sensor, global outside air temperature, coil air temperature sensors, low limit thermostat, space temperature and CO₂ sensors, and airflow monitor transmitters.
2. The BAS shall maintain operation of the unit according to its programmed schedule.
 3. Provide three-way control valve and actuator for the cooling coil.
 4. Provide wall-mounted temperature and CO₂ sensors as shown on the drawings. Provide zone averaging for control of the system and its components.
 5. During the programmed occupied mode, the supply fan shall start and shall run continuously with the outside air and exhaust air dampers closed. Exhaust fan and energy wheel shall remain off. Delay opening the outside air damper until the zone temperature has recovered from its setback or setup temperature setting. Once the zone temperature has been restored, operation shall continue as follows.
 - a. Outside air damper shall remain closed until the average space CO₂ level rises to 700 ppm. The outside air damper shall step open to maintain CO₂ level at or below 700 ppm. The return air and relief air dampers in the system shall modulate in unison to maintain the balance of air in the system.
 - b. The relief air damper shall open fully, and the exhaust fan shall start and ramp up in speed through its variable speed drive to track the outside air damper.
 - c. On a continued rise in CO₂ level, the exhaust fan shall increase its speed as the outside air damper continues to open up to its scheduled value. Whenever the average CO₂ level reaches 900ppm, activate an alarm at the OWS. On a decrease in CO₂ level below 700 ppm, the reverse shall occur.
 - d. When the fans fail to start once activated, initiate an alarm to the system after a twenty second delay. Monitor fans status with a current sensor on one leg of power feeding the fan motors.
 6. As the outside air damper opens, the energy recovery wheel shall start and preheat or precool outside air to the extent of its capacity. The gas fired heating section shall modulate through its unit controls to maintain average zone air temperature of 70°F, adjustable.
 - a. Unit mounted rotation sensor shall activate an alarm to the system if the energy wheel fails to start once activated. The system shall monitor discharge air temperature and alarm if DAT drops below 50°F, adjustable.

7. On a rise in the average zone air temperature above setpoint, the chilled water coil control valve shall modulate to maintain average zone air temperature of 75°F, adjustable. On a fall in temperature the reverse shall occur.
8. During the programmed un-occupied mode, the supply fan, heating, cooling and mixing box dampers shall cycle/modulate to maintain zone un-occupied temperatures of 60°F (heating) and 85°F (cooling), all adjustable. Unless required for economizer cycle, the outside air and relief air dampers shall remain closed, exhaust fan off, energy recovery wheel off, and return air damper fully open.
9. Interface with a common fire alarm input from the fire alarm system. The fire alarm contact shall be provided at the fire alarm panel by the Contractor for Division 26 - Electric. The status of the alarm contact shall be communicated throughout the BAS. When the fire alarm contact indicates an alarm condition, the BAS shall de-energize the unit. When de-energized, the damper motors shall spring return the outside and relief air dampers closed. Provide an alarm at the OWS to indicate fire alarm status.
10. The Mechanical Contractor shall install duct smoke detectors in the supply and return air ducts at the unit as furnished by the Contractor for Division 26 - Electric. When wired to the fire alarm system, the duct smoke detectors shall alarm the FAS. When the fire alarm contact indicates an alarm condition, the BAS shall de-energize the unit. When de-energized, the damper motors shall spring return the outside and relief air dampers closed.
11. The following items shall be displayed at the Operator's Terminal:
 - a. Zone average space temperature and CO2 levels.
 - b. Heating and cooling coil discharge air temperatures.
 - c. Discharge air temperature setpoint.
 - d. Return air and mixed air temperatures.
 - e. Rotation sensor alarm on the energy wheel.
 - f. Global outside air temperature.
 - g. Fire alarm system status/alarm.
 - h. Duct smoke detectors status: normal/alarm.
 - i. Commanded status of fans.
 - j. Supply fan operational status/alarm via current sensor.
 - k. Exhaust fan operational status/alarm via current sensor.
 - l. Fan drive status via frequency feedback on each fan VFD.
 - m. Diagram showing the layout of the equipment with major components and dynamic temperatures shown where temperature sensors exist in the system.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install system and materials in accordance with manufacturer's instructions and roughing-in drawings, and details and drawings. Install electrical work and use electrical products complying with requirements of these specifications. Mount controllers at convenient locations and heights.

- B. All wiring shall be properly supported and run in a neat and workmanlike manner. All wiring exposed and in equipment rooms shall run parallel to or at right angles to the building structure. All wiring within enclosures shall be neatly bundled and anchored to prevent obstruction to devices and terminals. All wiring shall be in accordance with all local and national codes. Low voltage wiring for space temperature sensors, communication bus between terminal units, etc., above accessible ceilings in finished spaces on the floors may be plenum rated cable. Wiring in all other locations shall be installed in EMT conduit. All electronic wiring shall be #18 AWG minimum THHN and shielded if required, except standard network (Ethernet, LonWorks, etc.) cabling shall be as tested and recommended in lieu of #18 gauge twisted, #22 or #24 gauge is acceptable if used as a part of an engineered structured cabling system. The control manufacturer must submit technical and application documentation demonstrating that this cabling system has been tested and approved for use by the manufacturer of both the control system and the engineered structured cabling system.
- C. Provide all sensing, control, and interlock wiring for the following:
 - System inputs and outputs
 - System communications
 - System power
 - System interlocks
 - Unit controls
- D. The Control Manufacturer shall enter all computer data into the Host computer including all graphics, control programs, initial approved parameters and settings, and English descriptors. The Control Manufacturer shall maintain diskette copies of all data file and application software for reload use in the event of a system crash or memory failure. One copy shall be delivered to the owner during training sessions, and one copy shall be archived in the Control Manufacturer's local software vault.

3.2 DATA CONTROL (D/C) AND GRAPHICS SUMMARY

- A. All hardware, custom software, application software, graphics, etc., necessary to accomplish the control sequences and display the graphics specified shall be provided as part of this contract. Provide all controllers, inputs, outputs, valves, dampers, actuators and flow meters required to provide the control and graphic data described. Provide software setpoints required for display in logical groups and graphics.
- B. Each digital output shall have a software-associated monitored input. Any time the monitored input does not track it's associated command output within a programmable time interval, a "command failed" alarm shall be reported.
- C. Where calculated points (such as CFM) are shown, they shall appear in their respective logical groups.
- D. Unless otherwise specified or approved prior to bidding, the primary analog input and the analog output of each DDC loop shall be resident in a single remote panel containing the DDC algorithm, and shall function independent of any primary or UC communication links. Secondary (reset type) analog inputs may be received from the primary network, but approved default values and/or procedures shall be substituted in the DDC algorithm for this secondary input if network communications fail or if the secondary input becomes erroneous or invalid.

3.3 ACCEPTANCE

- A. The Control Manufacturer shall completely check out, calibrate and test all connected hardware and software to insure that the system performs in accordance with the approved specifications and sequences of operations approved.
- B. Witnessed acceptance demonstration shall display and demonstrate each type of data entry to show site specific customizing capability; demonstrate parameter changes; execute digital and analog commands; and demonstrate DDC loop stability via trend of inputs and outputs.

3.4 MANUALS

- A. The following manuals will be provided:
 - 1. An Operators Manual shall be provided with graphic explanations of keyboard use for all operator functions specified under Operator Training.
- B. Computerized printouts of all GPC data file including all point processing assignments, physical terminal relationships, scales and offsets, command and alarm limits, etc.
- C. A manual shall be provided including revised as-built documents of all materials required under the paragraph "SUBMITTALS" on this specification.
- D. Two Operators Manuals, and two As-Built Manuals shall be provided to the owner.

3.5 TRAINING

- A. All training shall be by the BMCS contractor and shall utilize operators manuals and as-built documentation.
- B. Operator training shall include three (3) four-hour sessions encompassing modifying text and graphics, sequence of operation review, selection of all displays and reports, use of all specified OWS functions, troubleshooting of sensors (determining bad sensors), and password assignment and modification. One training session shall be conducted at system completion, one shall be conducted forty five days after system completion, and one at ninety (90) days, or as requested by the Owner.

3.6 SERVICE GUARANTEE

- A. The control system herein specified shall be free from defects in workmanship and material under normal use and service. After completion of the installation, the control manufacturer shall regulate and adjust all thermostats, control valves, motors and other equipment provided under this contract. If within twelve (12) months from date of acceptance either for beneficial use of final acceptance, whichever is earlier, any of the equipment herein described is proven to be defective in workmanship or materials, it will be replaced or repaired free of charge. The control manufacturer shall, after acceptance, provide any service incidental to the proper performance of the control system under guarantee outlined above for the period of one year. Normal maintenance of the system or adjustments of components is not to be considered part of the

guarantee. The control manufacturer will upon completion of the installation, during the warranty period, make available to the Owner, an annual service agreement covering all labor and material required to efficiently maintain the control system.

3.7 FINAL ADJUSTMENT

- A. After completion of installation, adjust thermostats, control valves, motors and similar equipment provided as work of this section.
- B. Final adjustment shall be performed by specially trained personnel in direct employ of installer of primary temperature control system.

END OF SECTION 23 09 00

SECTION 23 09 50

TESTING & BALANCING OF MECHANICAL SYSTEMS

PART 1 – GENERAL

1.1 JOB CONDITIONS

- A. Systems shall be completely installed and in continuous operation as required to accomplish the tests.
- B. Heating, ventilating and air conditioning equipment shall be completely installed and in continuous operation as required to accomplish the balance work specified.
- C. Adjust and balance shall be performed when outside conditions approximate design conditions indicated for heating and cooling functions.
- D. Make at least two inspections of the mechanical systems during construction to verify that balancing procedures may be accomplished. Report findings to the Construction Manager.
- E. Balancing firm shall balance Mechanical System two (2) times. The first time shall be considered a rough balance. Any discrepancy in air flow shall be addressed to the Construction Manager. The final balancing will be accomplished after review of rough balance reports.
- F. The final balancing reports shall be submitted and approved prior to project's being considered complete; i.e., commencement of warranties.

1.2 ENGINEER QUALIFICATIONS

- A. The firm shall be an independent organization having no affiliation with construction contractors, equipment sales or design engineering.
- B. The firm shall specialize in balancing heating, ventilating and air conditioning systems.
- C. The firm shall show proof of having balanced and tested at least five projects of similar size and scope.
- D. All field work shall be under the direct supervision of a registered Professional Engineer who is a full-time employee of the balancing firm.
- E. The firm shall be certified by and a member of the AABC (Associated Air Balance Council) or NEBB (National Environmental Balancing Bureau).

1.3 REPORT

- A. Data Sheets:
 - 1. Submit data sheets on each item of testing equipment required.

2. Include name of device, manufacturer's name, model number, latest date of calibration and correction factors.

B. Report Forms:

1. Submit specimen copies of report forms.
2. Forms shall be 8-1/2 x 11 inch paper for loose-leaf binding, with blanks for listing of the required test ratings and for certification of report.
3. Reports shall be on standard forms published by AABC or NEBB.

PART 2 – PRODUCTS

2.1 AIR BALANCE INSTRUMENTS

- A. Alnor Velometer with probes and alnor pitot tube.
- B. Rotating Vane Anemometer: 4 inch size.
- C. ASHRAE Standard Pitot Tubes, stainless steel 5/16 inch outside diameter, lengths 18 inches and 36 inches.
- D. Magnehelic Differential Air Pressure Gauges, 0 to 0.5 inches, 0 to 1.0 inch and 0 to 5.0 inches water pressure ranges, each arranged as a portable unit for use with a standard Pitot tube.
- E. Combination Inclined-Vertical Portable Manometer, range 0 to 5.0 inches water.

2.2 WATER BALANCING INSTRUMENTS

- A. 30 Inch Mercury U-Tube Manometer, 200 psig, with 3 valve bypass assembly and return wells or mercury check valves.
- B. Inspector's gauge testing set.
- C. Water Differential Pressure Gauge, 4-1/2 inch dial, 0 to 100 psi range.
- D. Pressure gauge measurement points, quick connect couplings, 1/4 inch psi.

2.3 SYSTEM PERFORMANCE MEASURING INSTRUMENTS

- A. Insertion Thermometers, with graduation at 0.5 degrees F for air and 0.1 degrees F for water.
- B. Sling Psychrometer.

PART 3 – EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Arrange and pay for all tests.
- B. Notify Construction Manager at least three working days in advance of test and conduct in presence of Construction Manager.
- C. Tests to be performed prior to insulation, covering or concealment.
- D. Provide signed report of completion of test with signature of witnesses. Report shall indicate:
 - 1. System Tested
 - 2. Date
 - 3. Specified test requirements and actual testing results
- E. The balancing firm shall report to and review the work required with the Construction Manager before beginning field balance work. The balancing firm shall make at least two inspections of the air systems during construction and shall report his findings in writing to the Architect/Engineer.
- F. The balancing firm shall cooperate with the Construction Manager and the Mechanical Contractor to effect smooth coordination of the balancing work with the job schedule.
- G. The balancing firm shall be responsible for getting the various systems into proper operation. They shall enlist the aid of the equipment suppliers and Mechanical Contractor as may be required to effect proper operation consistent with the contract plans and specifications.
- H. When the balancing firm cannot balance a belt-driven piece of equipment with the supplied belts and sheaves, inform the Mechanical Contractor that the Mechanical Contractor shall provide additional sheaves as spelled out in other Division 23 Sections.

3.2 CIRCULATING WATER SYSTEM TEST

- A. All piping tests shall be applied not only to piping, but also to all devices and equipment connected thereto with the exception of control valves, boilers or any other equipment which may be damaged by the test pressure. All valves shall be full open.
- B. Test at 100 psi hydrostatic pressure for 6 hours:
 - 1. Record pressures each hour
 - 2. Repair all leaks
 - 3. Retest until 6 hours can be completed with no leaks or loss of pressure.
- C. After completion of successful test, strainers shall be cleaned, then system shall be backflushed and strainers cleaned again.

3.3 DUCTWORK TESTING

- A. Witness testing conducted by the Mechanical Contractor per Section 230600, PART 3: EXECUTION.

3.4 BALANCING PROCEDURE

- A. Air System Balance:
 - 1. With the fan supply system set to handle normal minimum outdoor air, the balancing firm shall perform the following tests and compile the following information:

Air Handling Equipment

- a. Design Conditions:

- (1) CFM Supply Air
- (2) Static Pressure
- (3) CFM Fresh Air
- (4) Fan RPM

- b. Installed Equipment:

- (1) Manufacturer
- (2) Size/Model Number
- (3) Motor HP, Voltage, Phase, Full Load Amperes

- c. Field Test:

- (1) Fan Speed
- (2) No Load Operating Amperes
- (3) Fan Motor Operating Amperes
- (4) Calculated BHP

- d. Test for Total Air:

- (1) Size of discharge, return air and outside air ducts.
- (2) Number and locations of Velocity Readings taken.
- (3) Duct Average Velocity
- (4) Total CFM
- (5) Outside Air CFM
- (6) Return Air CFM

- e. Individual Outlets (Diffusers, Registers and/or Grilles):

- (1) Identify each outlet or inlet as to location and area and fan system
- (2) Outlet, manufacture and type
- (3) Outlet size
- (4) Outlet free area, core area, or neck area

- (5) Required FPM and test velocity found for each outlet.
 - (6) Required CFM and test results for each outlet
2. After completion of tests, adjustment and balancing under minimum fresh air conditions, set the system for 100% fresh air. Repeat the total CFM tests to check field versus design conditions. The results under 100% fresh air cycle shall agree with conditions found under "minimum fresh air operation" before the system is considered to be in balance. Adjustments of the proper dampers shall be made to achieve balance.
 3. Testing and adjusting of individual outlets shall be performed under procedures recommended by the manufacturers of the outlets. All outlets shall be set for air pattern required and all main supply air and return air dampers to be adjusted and set for design CFM indicated. Any required changes in air patterns, settings, etc., necessary for achieving correct air balance, shall be provided by this Contractor. Total CFM of all outlets shall agree with total CFM of all branches and the grand total shall agree with the air volume for the fan(s).
- B. Water Balance:
1. Water balance shall include chilled water and heating water systems. The balancing agency shall perform the following tests, compile data and submit reports.
 2. Pumps:
 - a. Design Data
 - (1) GPM, head
 - (2) RPM, BHP
 - b. Installed Equipment
 - (1) Manufacturer, Size
 - (2) Type Drive
 - (3) Motor HP, Volts, Cycles and Phase
 - (4) Full Load Amperes
 - c. Field Test
 - (1) Discharge Pressures: Full flow & no flow
 - (2) Suction Pressures: Full flow & no flow
 - (3) Operating Head and GPM
 - (4) No Load Amperes (where possible)
 - (5) Full Flow Amperes, No Flow Amperes
 - (6) Calculated BHP
 3. Heating and/or Cooling Elements Including Loop Water to all terminal Units:
 - a. Design Data:
 - (1) MBH Specified, GPM Specified

- (2) Entering Water Temperature (EWT)
- (3) Entering Air Temperature (EAT)
- (4) Water Temperature Drop (DTW)
- (5) Element Type Specified

b. Field Test:

- (1) Identify each element as to location
- (2) Required water temperature drop corrected for item (3) above
- (3) Actual entering air and water conditions (temperature and GPM)
- (4) Adjust element until required temperature drop is obtained

- C. In addition to the above work, the Balancing Firm shall check the operation of all automatic temperature control equipment; verify all thermostat, aquastat, etc., set-points and operations; and enlist the aid of the Mechanical Contractor and the Control Subcontractor to make necessary adjustments where required.

END OF SECTION 23 09 50

SECTION 26 00 00

GENERAL PROVISIONS – ELECTRICAL

PART 1 – GENERAL

1.1 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 of this Section.
- B. The specification or drawing and the design features or resulting construction disclosed, are the property of Furlow Associates, Inc., and shall not be reproduced without written permission.

1.2 DESCRIPTION OF WORK

- A. Provide all materials, equipment, labor, services and all appurtenances required to completely install and satisfactorily operate the various systems. The items listed below are for general guidance only and do not necessarily include the entire requirements for the project.
 - 1. Coordination with other trades
 - 2. Interior feeders
 - 3. Lighting and power panels
 - 4. Lighting branch wiring
 - 5. Power wiring
 - 6. Lighting fixtures and lamps
 - 7. Wiring devices
 - 8. Connections for electrically operated equipment
 - 9. Fire alarm and detection system (Existing system modified – No Specifications)
 - 10. Voice/Data System
 - 11. Related work as herein described or otherwise defined under the heading "Related Work".
- B. Wherever the term "provide" is used, it shall be understood to mean both "furnish" and "install".

1.3 RELATED WORK

- A. Equipment specified in sections of Divisions 1 thru 23 that require electric power supply.
- B. Work related to this trade as defined on the following contract drawings:

Architectural/Structural
HVAC
Plumbing
Theatrical Lighting
Theatrical Audio/Video

1.4 SITE CONDITIONS

- A. Attention of all bidders is called to the necessity for a careful inspection of the site, its present condition and encumbrances, the extent of the work, the protection to be afforded to adjacent properties or structure, availability of utilities, the extent and nature of the material required to be excavated and the amount of fill and removal. He shall also determine local or site limitations which will affect construction.

1.5 PERMITS, INSPECTIONS AND ORDINANCES

- A. All work shall be executed and inspected in accordance with local and state ordinances, rules and regulations and the requirements of public utilities having jurisdiction. The contractor shall secure and pay for all permits, inspections and connections required.
- B. The Electrical Contractor shall furnish a certificate of inspection to the Owner at the time of completion.
- C. Requirements of the following organization shall be considered minimum:
 - 1. National Electrical Code
 - 2. National Electrical Safety Code
 - 3. OSHA
 - 4. Local City and County Codes
- D. Reference to technical societies, trade organizations and governmental agencies are in accordance with the following:
 - 1. ANSI - American National Standards Institute
 - 2. ASTM - American Society for Testing Materials
 - 3. IEEE - Institute of Electrical and Electronics Engineers, Inc.
 - 4. NEC - National Electrical Code
 - 5. NEMA - National Electrical Manufacturer's Association
 - 6. NFPA - National Fire Protection Association
 - 7. MSS - Manufacturer's Standardization Society
 - 8. IES - Illuminating Engineers Society
 - 9. ETL - Engineering Testing Laboratories
 - 10. EIA - Electronic Industries Association
 - 11. OSHA - Occupational Safety and Health Administration
 - 12. Federal Specifications
 - 13. UL - Underwriters Laboratories, Inc.

1.6 QUALITY ASSURANCE

- A. Provide adequate supervision of labor force to assure that all aspects of the contract documents are fulfilled.
- B. Contractor to provide manufacturer's written certification that the following equipment has been installed and will operate correctly and in accordance with the manufacturer's warranty requirements.

Fire Alarm and Detection System

- C. Testing:
1. After completion of the work, the entire wiring system shall test entirely free from grounds, short circuits, opens, overloads and improper voltage.
 2. The grounding system shall be tested for a resistance of 25 ohms or less.
 3. Perform testing as follows: Arrange and pay for all tests, provide all equipment, materials and labor to perform test. Notify Engineer and Owner three (3) working days before tests are to be made. Conduct tests in the presence of the Engineer or authorized representative. Repeat tests after defects are corrected.
- D. Special Engineering Services: In the instance of complex specialized electrical power and signaling systems, and other similar systems, the installation and final connections of these systems shall be made by and/or under the supervision of a competent installation and service engineer who shall be a representative of the respective equipment manufacturer. Any and all expenses of these installation and service engineers shall be borne by this Contractor.

1.7 COORDINATION

- A. As a requirement of this project, the Electrical Contractor shall furnish coordination for his equipment and layouts with other subcontractors furnishing equipment and services for Divisions 1 thru 23. Any and all contractors who install their equipment or furnish services prior to coordination, any contractor who changes their equipment or services after coordination has occurred, without notifying associated subcontractors, shall be held responsible for making all required changes with no additional cost to the Owner. Or delay in construction time. This coordination will include conduit layout to allow access to equipment for maintenance.
- B. The Mechanical, Plumbing and Electrical Contractors are responsible to coordinate all manufacturer's recommended circuit breakers, starters, disconnects and fuse sizes for all equipment. Submission of a shop drawing will certify that this has been completed.
- C. The drawings and specifications reflect the type, number and size of services required for the equipment the design is based upon. Should the supplying subcontractor elect to furnish an alternate piece of equipment requiring difference services and/or space conditions, he shall inform the subcontractor furnishing those services and be held responsible to pay for all required changes as part of this contract.

1.8 SUBMITTALS

- A. Shop Drawings:
1. Shop drawings shall be submitted in accordance with Division 1 of these specifications except where herein modified.

NOTE: Submittals will only be reviewed once and resubmittals will be reviewed once. Any other submittals will be billed to the Contractor at the Engineer's standard rates.

2. Shop drawings comprising complete catalog cuts, performance test data for electrical equipment as required by other sections of Division 26 shall be submitted for review checking. The Contractor shall review these shop drawings for conformance to contract documents prior to submission and affix contractor's signature to each submittal certifying that this review has been done. By approving and submitting shop drawings, product data, wiring diagrams and similar materials, the Electrical Contractor represents that he and/or his subcontractor has determined and verified materials, field measurements and field construction data that relates to the work, and has checked and coordinated this information with all of the Divisions 1 thru 23 subcontractors.
3. All shop drawing submittals shall have the following identification data, as applicable, contained therein or permanently adhered thereto:
 - a. Project name
 - b. Project number
 - c. Sub-Contractor's, Vendor's and/or manufacturer's name and address.
 - d. Product identification.
 - e. Identification of deviation from the contract documents.
 - f. Applicable contract drawings and specification section number.
 - g. Shop drawing title, drawing number, revision number, and date of drawing and revision.
 - h. Resubmit revised or additional shop drawings as requested.
 - i. Wherever shop drawings or vendor's standard data sheets indicate work to be done "by others", it shall be the responsibility of the Contractor making the submission to identify by name, the Contractor who is to do this work. If the Contractor named is other than the Contractor making the submission, the shop drawing submission must be reviewed by the named Contractor and bear his mark of approval, prior to submission to the Architect/Engineer.
 - j. Where equipment proposed differs from that shown on the drawings or specified, he shall submit for approval drawings showing the manner in which the layout is affected by the substitution.
 - k. The Contractor shall keep one copy of approved shop drawings at the job site, filed in a suitable metal container. The shop drawings shall be cataloged and kept in good repair, and shall be available for use by the Owner, Architect and Engineer.
 - l. No equipment shall be ordered, fabricated, etc., before approval of shop drawings.

1.9 SUBSTITUTIONS

- A. Whenever a material, article, piece of equipment or system is identified in the following specification or indicated on the drawings by reference to manufacturers' or vendors' names, trade names, catalog numbers or the like, it is so identified for the purpose of establishing the basis of the Bid.
- B. Substitution approval must be obtained and included as an addendum item prior to the submission of the bid. An approved substitution shall not be considered as an approval for the contractor or an equipment vendor to deviate from the written portion of the specifications unless so stated in the addendum.
- C. The drawings illustrate the space allocated for equipment and the Contractor shall install the equipment accordingly. If changes are required in the building or arrangement due to substitution of equipment, the Contractor making the substitution must pay for the necessary modifications.
- D. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but shall not be limited to space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, then they shall be responsible for any and all additional costs associated with the changes required by other trades.

1.10 LUBRICATION

- A. Furnish, install and maintain all required lubrication of any equipment operated prior to acceptance by the Owner. Lubrication shall be as recommended by the equipment manufacturer.
- B. Provide one year's supply of lubricants to Owner at date of acceptance.
- C. Verify that required lubrication has taken place prior to any equipment start-up.

1.11 ADJUSTMENT & CLEANING

- A. Adjust and clean equipment to be placed in proper operation condition.

1.12 EQUIPMENT START-UP

- A. Verify proper installation by manufacturer or his representative.
- B. Advise General Contractor 2 days prior to actual start-up.
- C. Verify proper operation. Obtain signed statement by manufacturer or his representative that equipment is operating within warranty requirements. Submit statement to General Contractor.

1.13 OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Properly and fully instruct Owner's personnel in the operation and maintenance of all systems and equipment.
- B. Insure that the Owner's personnel are familiar with all operations to carry on required activities.
- C. Such instruction shall be for each item of equipment and each system as a whole.
- D. Provide report that instruction has taken place. Include in the report the equipment and/or systems instructed, date, contractor, Owner's personnel, vendor, and that a complete operating and maintenance manual has been reviewed.
- E. Manual shall include all instructions on operation, maintenance, repair parts list, lubrication requirements, brochures, catalogue cuts, wiring diagrams, piping diagrams, control sequences, service requirements, names and addresses of vendors, suppliers and emergency contacts. Three manuals shall be provided.
- F. Submit manuals for review prior to operating instruction period. Manuals shall be 8-1/2 x 11" with hard cover, suitably bound.

1.14 TOOLS

- A. All equipment furnished by the Contractor which requires special tools or devices other than those normally available to the maintenance or operating staff shall be furnished in duplicate to the Owner, sufficiently marked, packed or boxed for staff usage. The tools provided shall be listed by the Contractor identified as to their use or the equipment applicable in a written transmittal to the Owner.

1.15 CLEANING AND FINISHING

- A. After equipment start-up and all operating tests have been made and the system pronounced satisfactory, each respective Contractor shall go over the entire project, clean all equipment, etc., installed by him and leave in a clean and working condition. Any surfaces found marred after this final cleaning shall be refinished or replaced by each Contractor at no cost to the Owner.

1.16 OPERATING AND MAINTENANCE MANUALS

- A. Three complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished to the Architect. Each set shall be furnished before the contract is completed. The following identification shall be inscribed on the covers: the words "OPERATING AND MAINTENANCE INSTRUCTIONS", the name and location of the building, the name of the Contractor and the name of the Architect and Engineer. Flysheet shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8-1/2 by 11 inches, with large sheets of drawings folded in. The instructions shall include, but shall not be limited to, the following:

Approved wiring and control diagrams, with data to explain the detailed operation and control of each component.

A control sequence describing start-up, operation and shutdown.

Operating and maintenance instructions for each piece of equipment, including lubrication instructions.

Manufacturer's bulletins, cuts and descriptive data.

Parts lists and recommended spare parts.

1.17 SERVICE INTERRUPTION

- A. All service interruptions to the electric or related systems, whether during regular working hours or at any other time, must be coordinated with the Owner. All such interruptions shall be so scheduled and planned as to require a minimum of time and shall occur only during a mutually satisfactory period.

1.18 INTERPRETATION OF SYSTEMS

- A. The interpretation of the Architect will be final in the event there is a lack of understanding of the full scope or requirements of the systems under this contract.

1.19 LAYOUTS

- A. On small scale drawings, i.e., 1/8" - 1'-0", the approximate location of the electrical branch circuit items such as receptacle, telephone, grounding and equipment outlets are shown to indicate their existence. The exact location of these items and their related raceways are governed by structural conditions, coordination with the work of other trades and the Architect's final decision. By accepting a contract, the Contractor agrees to install the work in accordance with the above statement and within the contract price.

PART 2 – PRODUCTS

2.1 MATERIAL

- A. All material shall be new and of good quality. Material shall conform to all accepted trade standards, codes, ordinances, regulations, or requirements governing same, and shall be approved before being installed.
- B. The Architect reserves the right to require the Contractors to submit samples of any or all articles or materials to be used on the project.
- C. Where any device or equipment is herein referred to in the singular number, such as "the panel", this reference shall be deemed to apply to as many such devices or equipment as are required to complete the installation as shown on the drawings or specified.
- D. All materials and equipment used in the work shall comply with the standards of recognized authorities such as UL, NEMA, IEEE, ETL, IES and EIA in every instance where such standards have been established for the particular type of materials to be installed.

- E. All similar pieces of equipment or materials of the same type or classification used for the same purpose shall be of the same manufacturer.
- F. All manufactured equipment shall have factory applied finishes.

2.2 WARRANTY

- A. Wherever in the specification sections of this division, reference is made to a specific warranty period, this warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the contract documents.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Prior to performing the work, examine areas and conditions; check and verify all dimensions, under which the work is to be installed and notify the Architect in writing of conditions and dimensions detrimental to the proper and timely completion of the work. Do not proceed until authorization is given by the Architect.

3.2 LAYING OUT WORK

- A. The Contractor is responsible for the accuracy of all lines, elevations, and measurements, grading and utilities and must exercise proper precaution to verify figures shown on drawings before laying out work and will be held responsible for any error resulting from his failure to exercise such precaution.

3.3 WORKMANSHIP

- A. Install all work neat, trim, parallel and plumb with building lines in accordance with standard trade practice acceptable to the Architect.

3.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect all equipment and materials from damage during transportation, storage and installation.

3.5 PROTECTION

- A. Protect all work, equipment and materials during construction up to the time of acceptance by the Owner.

Arrange and design the protection to prevent damage from infiltration or dust, debris, moisture, chemicals and water. Cap or plug electrical raceways.

- B. Protect all surfaces against damage from welding, cutting, burning, or similar construction functions. This protection shall be accomplished by care in operations, covering and shielding. Special care is directed to exposed finished masonry, metal or wood surfaces and painted surfaces. Corrective measures required shall be accomplished by the trade which made the original installation when and as directed by the Architect at the expense of the Contractor.

- C. Cover and protect all lighting fixtures as may be necessary until completion of the work. Replace damaged fixtures or damaged fixture parts as directed by the Architect at no cost to the Owner.
- D. Do not install devices, polished metal fittings or parts until adjoining tile or masonry work is completed.
- E. Maintain and replace protective covering when so directed by the Architect until the work is ready for acceptance.

3.6 CUTTING & PATCHING

- A. Furnish information to the General Contractor as to sizes and locations of recesses required to install panel boxes and other equipment or devices. If the information is late or incorrect, this Contractor shall, at his own expense, have the trade which originally installed the work do the required cutting and patching.
- B. Perform all cutting of concrete or other material for passage of raceways as required to install the work.
- C. Close all such openings around raceways with material as specified under the heading "SEALING".
- D. Install concealed work in place for the mason to wall-in as he carries up the walls; otherwise, this Contractor will be responsible as stated in the first paragraph.

3.7 SEALING

- A. Where raceways pass through fire-rated walls and floors, seal opening with RTV foam.
- B. Seal raceways entering the building to conform to the requirements of the NEC.

3.8 OFFSETS AND MODIFICATIONS

- A. Furnish and install all offsets necessary to install the work and to provide clearance for the work of other trades.
- B. Maintain adequate clearance as directed by the Architect/Engineer.
- C. Incidental modifications necessary to the installation shall be made as necessary and at the direction and/or approval of the Architect.

3.9 SLEEVES

- A. Furnish and install sleeves for all raceways passing through floors and walls. Sleeves shall be Schedule 40 galvanized steel pipe and shall extend 1" above finished floor surface. Where sleeves are set in interior walls, they shall finish flush with the wall.

- B. Furnish and install watertight sleeves for all raceways extending through foundation walls into crawl spaces, mechanical rooms or basement areas from building exterior or from unexcavated areas to building interior. Sleeve shall consist of extra heavy pipe sleeve with anchor flange. Space between raceway and the sleeve shall be sealed with modular wall and casing seal similar to Thunderline Corporation "Link-Seal", Metraseal or approved substitute. Install seal in strict accordance with the manufacturer's recommendations.

3.10 ITEMS RECESSED IN MASONRY CONSTRUCTION

- A. Wherever boxes, electric panels, equipment, devices, access panels, and similar items of electrical construction are installed in exposed masonry construction, the Contractor shall utilize and submit for approval items of such size, height, and arrangement to conform to the corresponding masonry unit. The Contractor shall include as part of this contract, the necessary offsets, adjustments and relocations necessary to conform with the instructions of the Architect as to the final location of the equipment item in the exposed masonry.
- B. As part of his contract and before the purchase of the items hereinbefore mentioned, the Contractor shall notify the Architect of such modifications in the building arrangement that will be necessary to accommodate the proposed equipment.

3.11 ROOF FLASHINGS

- A. All conduit extending through roofs shall be provided with watertight flashing and counterflashing as hereinafter described.
- B. Furnish and install standard counterflashing fittings on the conduit or properly designed clamped counterflashing with caulking as directed by the Architect/Engineer.

3.12 PAINTING

- A. Refinish all factory applied finishes that have been damaged to match the original finish as directed by the Architect.
- B. Prime coat all steel furnished under this Division with material and methods as described in another Section under the heading "PAINTING".

3.13 EQUIPMENT CONNECTIONS

- A. Provide required wiring, raceways and final connections for all equipment provided by this Division and Divisions 1 thru 23.
- B. Make final connections in accordance with wiring diagrams obtained from equipment manufacturer.
- C. Rough-in in accordance with approved shop drawings from the manufacturer or supplier of the equipment. Rough-in prior to shop drawing approval will be subject to change without adjustment to contract cost.

3.14 BALANCING

- A. The system of feeder and branch circuits for power and lighting shall be connected to panel busses in such a manner as to electrically balance the connected load as close as is practicable. Should the Owner disclose any unfavorable conditions reacting on the service, this Contractor shall make such changes as may be suggested to balance the load.

3.15 GUARANTEE

- A. All work shall be guaranteed to be free from defects for a period of one year of operation from date of acceptance by the Owner unless otherwise specified in Division 1.
- B. Guarantee shall be extended on an equal time basis for all non- operational periods due to failure within the guarantee period.
- C. Contractor to include an 11 month “walk-thru” of the building system with representatives of the School District, Architect, Engineer and the Construction Manager. The purpose is to establish a list of corrective work that relates to operational issues, material/installation deficiencies.

END OF SECTION 26 00 00

SECTION 26 00 55

ELECTRICAL IDENTIFICATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. This section is a Division 26 Basic Materials and Methods Section, and is part of each Division 26 Section making reference to electrical identification specified herein.

1.2 DESCRIPTION OF WORK

- A. Types of electrical identification specified in this section include the following:

- Cable conductor identification.
- Operational instructions and warnings.
- Danger signs.
- Equipment/system identification signs.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products of one of the following (for each type of marker):

- W. H. Brady Co.
- Ideal Industries, Inc.
- Seton Name Plate Co.
- 3M Electrical Products

2.2 ELECTRICAL IDENTIFICATION MATERIALS

- A. Provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.

2.3 COLOR-CODED PLASTIC TAPE

- A. Provide manufacturer's standard vinyl tape not less than 7 mils thick by 3/4" wide.
- B. Colors: Unless otherwise indicated or required by governing regulations, provide tape color as indicated in Paragraph 3.2.B.
- C. Tape shall be of Type 3M Scotch 35 for color coding, Scotch Super 33+ for splices and Tem Flex 1700 for general use.

2.4 CABLE/CONDUCTOR IDENTIFICATION BANDS

- A. Provide manufacturer's standard vinyl cloth, self-adhesive cable/conductor markers of wrap-around type; either pre-numbered, plastic-coated type, or write-on type with clear plastic, self-adhesive cover flap; numbered to show circuit identification.

2.5 BAKED ENAMEL DANGER SIGNS

- A. Provide manufacturer's standard "DANGER" signs of baked enamel finish on 20-gage steel; of standard red, black and white graphics; 14" x 10" size except where 10" x 7" is the largest size which can be applied where needed, and except where larger size is needed for adequate vision; with recognized standard explanation wording (as examples: HIGH VOLTAGE, KEEP AWAY, BURIED CABLE, DO NOT TOUCH SWITCH).

2.6 ENGRAVED PLASTIC-LAMINATE SIGNS

- A. Provide engraved stock melamine plastic laminate, in sizes and thicknesses indicated, engraved with engraver's standard letter style of sizes and wording indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
- B. Thickness: 1/16" for units up to 20 sq. in. or 8" length; 1/8" for larger units.
- C. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.

2.7 LETTERING AND GRAPHICS

- A. Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of electrical systems and equipment.

PART 3 – EXECUTION

3.1 APPLICATION AND INSTALLATION

- A. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.
- B. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.

3.2 CABLE/CONDUCTOR IDENTIFICATION

- A. Apply cable/conductor identification on each cable and conductor in each box/enclosure/cabinet where wires of more than one circuit or communication/signal system are present. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project electrical work.

B. Conductor Color Coding:

1. All conductors used in all systems shall have insulation that is inherently colored. All conductors of a system performing the same function shall be colored alike throughout the project.
2. Equipment Grounding Conductors:
 - a. Standard and/or general feeders or circuits shall be green.
 - b. Isolated feeders or circuits shall be green with yellow stripe.
3. On larger conductors, where colored insulation is not available, colored tape adhesive vinyl bands 3/4" width may be installed 6" maximum from the end of the conductors. Where passing through pull boxes without splice, each conductor shall be banded.
4. Power system conductor colors shall be as follows:
 - a. 120/208 Volt System
 - Phase A - Black
 - Phase B - Red
 - Phase C - Blue
 - Neutral - White or Gray
 - b. 277/480 Volt System
 - Phase A - Brown
 - Phase B - Orange
 - Phase C - Yellow
 - Neutral - White or Gray

3.3 DANGER SIGNS

- A. In addition to installation of danger signs required by governing regulations and authorities, install appropriate danger signs at locations indicated and at locations subsequently identified by Installer of electrical work as constituting similar dangers for persons in or about project.
- B. High Voltage: Install danger signs wherever it is possible, under any circumstances, for persons to come into contact with electrical power voltages higher than 110-120 volts.

3.4 EQUIPMENT/SYSTEM IDENTIFICATION

- A. Install engraved, plastic laminate sign on each major unit of electrical equipment in building, including central or master unit of each electrical system including communication/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering on 1-1/2" high sign (2" high where 2 lines are required), white lettering in black field. Provide text matching terminology and numbering of the contract documents and shop drawing. Provide signs for each unit of the following categories of electrical work:

1. Panelboards, electrical cabinets and enclosures.
 2. Access panel/doors to electrical facilities.
 3. Major electrical switchgear, main and feeder circuit breakers and/or disconnects..
- B. Install signs at locations for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate the substrate.

3.5 JUNCTION AND PULL BOX IDENTIFICATION

- A. Emergency Systems: Each junction and pull box cover shall be painted orange. Use black indelible liquid marker to label "EMERG." in 3/8" letters minimum.
- B. Fire Alarm System: Each junction and pull box cover shall be painted red. Use black indelible liquid marker to label "F.A." in 3/8" letters minimum.
- C. Feeders Shown on Single Line Diagram: Each junction and pull box shall be marked with black indelible liquid marker with the assigned feeder number "FDR #38" in 3/8" letters minimum.

END OF SECTION 26 00 55

SECTION 26 01 10

RACEWAYS

PART 1 – GENERAL

1.1 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 Section 260000 for General Provisions - Electrical.

1.2 DESCRIPTION OF WORK

- A. Types of raceways in this section include the following:

- Rigid metal conduit
- Intermediate metal conduit
- Electrical metallic tubing.
- Flexible metal conduit.
- Liquid-tight flexible metal conduit.
- Surface raceway.
- Wireways.

1.3 REFERENCE STANDARDS

- A. Refer to Section 260000 for a general description of requirements applying to this Section.

1.4 QUALITY ASSURANCE

- A. Refer to Section 260000 for a general description of requirements applying to this Section.

1.5 WARRANTY/GUARANTEES

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

1.6 COORDINATION

- A. The drawings and details there upon are scheme and/or diagrammatic in nature, and indicate the need and intent of the design. These are to be used for general guidance only. It shall be the responsibility of the Electrical Contractor to coordinate, with other Division Subcontractors, the installation of all raceways, raceway supports, junction boxes and required fittings. This coordination will include conduit layout to allow access to equipment for maintenance.

- B. This coordination shall be carried out prior to actual installation; this shall be done to eliminate the possibility of conflicts between trades on items such as access, clearances and maintenance issues that may arise after completion of construction.
- C. Should the coordination not be carried out prior to installation, and a conflict exists, the installing contractor shall remove and reinstall the equipment as required to clear the conflict at no additional cost to the Owner and no delay in project completion.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Rigid Metal Conduit:

- 1. Raceway: Full weight, heavy wall rigid steel with zinc coating conforming to ANSI-C80.1.
- 2. Fittings: Cast malleable iron fittings with threaded hubs, insulated throat and zinc protective coating.
- 3. Subject to compliance with requirements, provide products of one of the following:

Allied Tube and Conduit Corporation
LTV Steel Tubular Products Co.
Wheatland Tube

B. Intermediate Metal Conduit:

- 1. Raceway: Light weight, rigid steel, hot dipped galvanized manufactured in accordance with UL1242.
- 2. Fittings: Cast malleable iron fittings with threaded hubs, insulated throat and zinc protective coating.
- 3. Subject to compliance with requirements, provide products of one of the following:

Allied Tube and Conduit Corporation
LTV Steel Tubular Products Co.
Wheatland Tube

C. Electrical Metallic Tubing:

- 1. Raceway: Light weight, thin wall, rigid steel, hot dipped galvanized manufactured in accordance with ANSI C80.3.
- 2. Fittings: Raintight, insulated throat, compression type with zinc protective coating.

3. Subject to compliance with requirements, provide products of one of the following:

Allied Tube and Conduit Corp.
LTV Steel Tubular Products Co.
Wheatland Tube Co.

D. Flexible Metal Conduit:

1. Raceway: Construct of single strip, flexible, continuous, interlocked, and double-wrapped steel, galvanized inside and outside.
2. Fittings: Steel, insulated throat, with zinc protective coating.
3. Subject to compliance with requirements, provide products of one of the following:

AFC
Alflex Corp.
Electri-Flex Company

E. Liquid-Tight Flexible Metal Conduit:

1. Raceway: Construct of single strip, flexible, continuous, interlocked, and double-wrapped, galvanized inside and outside, coat with liquid-tight jacket of flexible polyvinyl chloride.
2. Fittings: Steel, water and oiltight, insulated throat, with zinc protective coating.
3. Subject to compliance with requirements, provide products of one of the following:

AFC
Alflex Corp.
Electri-Flex Company

F. Surface Raceway:

1. Raceway: Two-piece wireway, base to be .040" steel, cover to be .025" steel. Complete unit shall have a cross sectional area of 0.26 square inches. Finish shall be buff. Wireway to be similar to Wiremold Cat. No. 700 B+C.
2. Fittings: Wireway shall be provided with a complete line of, but shall not necessarily be limited to, couplings, offsets, elbows, adapters, hold-down clips, end-caps and other components and accessories as needed for a completed system.
3. Subject to compliance with requirements, provide products of one of the following:

Walker, Butler Manufacturing Co.
Wiremold Co.
Hubbell

G. Wireways:

1. Furnish electrical wireways of the type, size, and style for each service indicated. Wireway shall be a complete assembly including but not necessarily limited to, couplings, offsets, elbows, adapters, hold-down clips, end-caps and other components and accessories as needed for a complete system.
2. System shall fulfill wiring requirements as indicated in contract documents, and shall comply with applicable portions of Article 362 of the National Electrical Code.
3. Subject to compliance with requirements, provide products of one of the following:

Circle AW Products Co.
The EMF Company, Inc.
Hoffman Engineering Company
Square "D" Company

- H. The above items shall include the statement "Approved Equal" and/or "Approved Substitute". This statement requires that the product or item be in compliance with the written intent of this specification and the submission meets the requirements of Section 260000.

PART 3 – EXECUTION

3.1 INSTALLATION OF ELECTRICAL RACEWAYS

- A. Install electrical raceways in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA "Standard of Installation", and complying with recognized industry practices.
- B. Coordinate with other work as necessary to interface installation of electrical raceways, wireways and required components.
- C. Raceways used for distribution, feeders, or branch circuits shall be a minimum size of 3/4" or equal equivalent cross-sectional area. Raceways used for control and signal shall be a minimum size of 1/2" or equal equivalent cross-sectional area.
- D. All raceways shall be concealed within the building construction, where indicated on the floor plans surface raceway shall be installed. Should it be impossible or impracticable to install a raceway concealed and surface raceway is not indicated, the Contractor shall consult with the Architect or Engineer for approval prior to installation.
- E. All raceways installed in ceiling cavities and exposed within mechanical spaces shall be run parallel with building lines and installed level and square at the proper elevation/height.
- F. Complete the installation of electrical raceways before starting the installation of cables/wires within the raceway.
- G. Furnish and install one (1) nylon or fiberglass pull cord in each empty raceway. Each empty raceway shall be cleaned, capped, and tagged as to its termination location.

- H. Install liquid-tight flexible metal conduit for connections to motors and for other electrical equipment when subject to movement and vibration, and also where subjected to one or more of the following conditions:
 - 1. Exterior locations.
 - 2. Moist or humid atmosphere when condensation can be expected to accumulate.
 - 3. Corrosive atmosphere.
 - 4. Subjected to water spray.
 - 5. Subjected to dripping oil, grease or water.

- I. Install Electrical Metallic Tubing for building interior electrical work except:
 - 1. Underground
 - 2. In gravel, cinder, concrete or other sub-base floor construction.
 - 3. Horizontal runs in concrete floor slabs.
 - 4. Where exposed to the elements.
 - 5. In masonry construction below finished grade.
 - 6. Vertically in poured concrete walls.

- J. Refer to Section 260000 for excavation, shoring and pumping, concrete and backfilling requirements.

- K. Where and whenever possible, install horizontal electrical raceways as tight to building construction as possible and above water, drain and steam piping. A separation of at least six (6) inches shall be maintained between electrical conduits and hot water and steam piping.

- L. In accordance with NEC requirements, install Rigid or Intermediate Metal Conduit where Electrical Metallic Tubing is not permitted.

- M. In all instances where recessed type panelboards are installed, furnish and install one (1) one inch raceway for each two (2) future circuits for which "space" or "spare" provisions have been made in the panelboard. These raceways shall extend between the panelboard cabinet and a convenient location above an access panel or a removable tile ceiling construction and capped.

3.2 CLEANING

- A. Upon completion of installation of raceways, inspect interiors of raceways; remove burrs, dirt and construction debris.

END OF SECTION 26 01 10

SECTION 26 01 20

WIRES AND CABLES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. This section is a Division 26 Basic Materials and Methods section and is part of each Division 26 Section making reference to wires and cables specified herein.

1.2 DESCRIPTION OF WORK

- A. Electrical wire and electrical cable work is indicated by drawings and specifications.
- B. Types of wire, cable and connectors in this section include, but not limited to the following:
- Copper conductors.
Tap type connectors.
Split-bolt connectors.
- C. Refer to other sections of Division 26 for, but not limited to, raceways, connections used in conjunction with wire and cable work.
- D. Applications for wire, cable and connectors required for project are as follows unless otherwise indicated:
1. Power Distribution Circuitry.
 2. Appliance and Equipment Circuitry.
 3. Motor Branch Circuitry.
 4. Control Circuitry.
 5. Signal/Communication Circuitry.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Wire and Cable

Anaconda Wire and Cable Co.
Advance Wire and Cable, Inc.
American
Cerro Wire and Cable Co.
Electrical Conductors, Inc.
General Cable Corp.
Hitemp Wires, Inc.
Rome Cable Corp.
Southwire Company
Triangle PWC,, Inc.

The Okonite Co.
General Electric Co.

Connectors

Burndy Corp.
Eagle Electric Mfg. Co., Inc.
Gould, Inc.
Ideal Industries, Inc
Joslyn Mfg. and Supply Co.
O-Z/Gedney Co.
Pyle National Co.
Thomas and Betts Co.

2.2 WIRE, CABLE AND CONNECTIONS

- A. Except as otherwise indicated, provide wire, cable and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer, and as required for the installation. Minimum wire and cable size is #12 AWG for power and branch circuits and #14 AWG for control and signal/communication circuits unless otherwise indicated.
- B. Wire: Provide factory fabricated wire of sizes, ratings, materials and types indicated for each service. Where not indicated, provide proper selection as determined by Installer to comply with project's installation requirements and NEC standards. Select from the following types, materials, conductor configurations, insulation and coverings:

UL Type: THHN
UL Type: TW
UL Type: THW
UL Type: THWN
UL Type: TF
UL Type: XHHW
UL Type: MC (Metal Clad)

Material: Copper

Conductors: Solid (AWG 14 to AWG 10 only).
Conductors: Concentric-lay-stranded (standard flexibility)

Outer Covering: Nylon
Outer Covering: Thermoplastic

- C. Connectors: Provide factory fabricated metal connectors of sizes, ratings, materials, types and classes as required for each service. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and NEC standards. Select from the following types, classes, kinds and styles.

Type: Pressure
Type: Crimp
Type: Threaded

Class: Insulated
Class: Non-insulated

Kind: Copper (for CU to Cu connection).

Style: Butt connection
Style: Elbow connection
Style: Combined "T" and straight connection
Style: "T" connection.
Style: Split-bolt parallel connection
Style: Tap connection
Style: Pigtail connection

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install electrical cables, wires and connectors, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices.
- B. Coordinate cable and wire installation work with electrical raceway and equipment installation work, as necessary for proper interface. Pull conductors together where more than one is being installed in a raceway. Use pulling compound or lubricate, where necessary; compound must not deteriorate conductor or insulation. Use pulling means including fish tape, cable or rope which cannot damage raceway. Rope must be used as pulling means when pulling wires or cables into plastic conduit and duct. Keep conductor splices to a minimum and install in junction boxes only. No splices shall be permitted within conduit. Install splices and tapes which have mechanical strength and insulation rating equivalent or better than conductor. Use splice and tape connectors which are compatible with conductor material.

3.2 FIELD QUALITY CONTROL

- A. Prior to energization, test cable and wire for continuity of circuitry and also for short circuits. Correct malfunctions when detected.
- B. Subsequent to wire and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements.

END OF SECTION 26 01 20

SECTION 26 01 21

WIRE CONNECTIONS AND DEVICES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. This section is a Division 26 Basic Materials and Methods Section and is part of each Division 26 Section making reference to connectors and termination devices specified herein.

1.2 DESCRIPTION OF WORK

- A. Extent of electrical connectors and termination work is indicated by drawings and specifications.
- B. Types of connectors and termination devices in this section include, but are not limited to the following:
 - 1. Tap type connectors.
 - 2. Split-bolt connectors.
- C. Refer to other sections of Division 26 for, but not limited to, raceways, wires and cables used in conjunction with connectors and termination devices.
- D. Applications for connectors and termination devices required for project are as follows unless otherwise indicated:
 - 1. Branch circuitry
 - 2. Equipment circuitry
 - 3. Control circuitry

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's data on electrical connectors, high voltage termination to the Engineer.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide connectors, high voltage terminations of one of the following manufacturers for each item used:

Burndy Corp.
Eagle Electric Mfg. Co., Inc.
Gould, Inc.
Ideal Industries, Inc.
Joslyn Mfg. and Supply Co.
O-Z/Gedney Co.

Pyle National Co.
Thomas and Betts Co.
Cooper Power Systems

2.2 CONNECTORS

- A. Provide factory fabricated metal connectors of sizes, ratings, materials, types and classes as indicated for each service. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and NEC standards.

Type: Pressure
Crimp
Threaded

Class: Insulated
Non-Insulated

Kind: Copper (for CU to Cu connection).

Style: Butt Connection
Elbow connection
Combined "T" and straight connection
"T" connection
Split-bolt parallel connection
Tap connection
Pigtail connection

PART 3 – EXECUTION

3.1 600 VOLT CABLE CONNECTOR INSTALLATION

- A. Install electrical connectors, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices.
- B. Coordinate cable, wire and connector installation work with electrical raceway and equipment installation work, as necessary for proper interface. Pull conductors together where more than one is being installed in a raceway. Use pulling compound or lubricate, where necessary, compound must not deteriorate conductor or insulation, and must be in accordance with wire and cable manufacturer's recommendations. Use pulling means including fish tape, cable or rope which shall not damage raceways including plastic conduits and ducts.

3.2 HIGH VOLTAGE TERMINATION INSTALLATION

- A. Install high voltage terminations in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices.

- B. Coordinate terminations with cable, raceway and equipment installation work, as necessary for proper interface. Contractor shall coordinate termination kits with the size, type and style of high voltage cable being installed, in accordance with cable and termination manufacturer's written instructions and recommendations.

3.3 FIELD QUALITY CONTROL

- A. Prior to energization, test cable and wire for continuity of circuitry and also for short circuits. Correct malfunctions when detected.
- B. Subsequent to wire and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements.

END OF SECTION 26 01 21

SECTION 26 01 35

ELECTRICAL BOXES & FITTINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. This section is a Division 26 Basic Materials and Methods section, and is a part of each Division 26 section making reference to electrical wiring boxes and fittings specified herein.

1.2 DESCRIPTION OF WORK

- A. Types of electrical boxes and fittings in this section include the following:

Outlet boxes.
Junction boxes.
Pull boxes.
Conduit bodies.
Bushings.
Locknuts.
Knockout closures.

PART 2 – PRODUCTS

2.1 INTERIOR METALLIC OUTLET BOXES

- A. Provide galvanized flat rolled sheet steel interior outlet non-gangable wiring boxes, of types, shapes and sizes, including box depths, to suit each respective location and installation; construct with stamped knockouts in back and sides and with threaded screw holes with corrosion-resistant screws for securing box covers and wiring devices.
- B. Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and fulfilling requirements of individual wiring situations. Choice of accessories is Installer's option.
- C. Manufacturer: Subject to compliance with requirements, provide interior outlet boxes of one of the following:

Appleton Electric Co.
Bell Electric/Square D Co.
Pass and Seymour, Inc.
RACO, Inc.
Steel City/Midland-Ross Corp.

2.2 WEATHERPROOF OUTLET BOXES

- A. Provide corrosion resistant cast-metal weatherproof outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit ends, cast-metal face plates with spring-hinged waterproof caps suitably configured for each application, including face plate gaskets and corrosion-resistant fasteners.
- B. Manufacturer: Subject to compliance with requirements, provide weatherproof outlet boxes of one of the following:

Arrow-Hart Div., Crouse-Hinds Co.
Bell Electric/Square D Co.
Harvey Hubbell, Inc.
O-Z/Gedney Co.
Slater Electric Co.

2.3 JUNCTION PULL BOXES

- A. Provide galvanized code-gauge sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.
- B. Manufacturers: Subject to compliance with requirements, provide junction and pull boxes of one of the following:

Adalet-PLM Div., Scott and Fetzer Co.
Appleton Electric Co.
Arrow-Hart Div., Crouse-Hinds Co.
Bell Electric/Square D Co.
GTE Corporation
Keystone Columbia, Inc.
O-Z/Gedney Co.
Slater Electric Co.
Spring City Elect. Mfg. Co.

2.4 CONDUIT BODIES

- A. Provide galvanized cast-metal conduit bodies, of types, shapes, and sizes, to suit respective locations and installation, construct with threaded-conduit-entrance ends, removable covers, and corrosion-resistant screws.
- B. Manufacturers: Subject to compliance with requirements, provide conduit bodies of one of the following:

Appleton Electric Co.
Crouse-Hinds Co.
Gould, Inc.
Killark Electric Mfg. Co.

O-Z/Gedney Co.
Spring City Electrical Mfg. Co.

2.5 BUSHINGS, KNOCKOUT CLOSURES AND LOCKNUTS

- A. Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and insulated malleable iron conduit bushings, offset connectors, of types and sizes to suit respective uses and installation.
- B. Manufacturers: Subject to compliance with requirements, provide bushings, knockout closures, locknuts and connectors of one of the following:

Appleton Electric Co.
Burndy Corp.
Crouse-Hinds Co.
Gould, Inc.
O-Z/Gedney Co.
RACO, Inc.
Steel City/Midland-Ross Corp.
Thomas and Betts Co., Inc.

PART 3 – EXECUTION

3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS

- A. Install electrical boxes and fittings, complying with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work.
- C. Provide weatherproof outlets for interior and exterior locations exposed to weather or moisture.
- D. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- E. Install boxes and conduit bodies in those locations to ensure ready accessibility of electrical wiring.
- F. Avoid using round boxes where conduit must enter box through side of box, which would result in difficult and insecure connections when fastened with locknut or bushing on rounded surface.
- G. Fasten boxes rigidly to substrates or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.
- H. Provide electrical connections for installed boxes.
- I. Pull boxes and junction boxes shall be furnished and installed in all conduit runs at intervals not exceeding 100 feet maximum.

- J. Identify each circuit in all pull boxes and junction boxes whether the box contains one or more circuits.

END OF SECTION 26 01 35

SECTION 26 01 40

WIRING DEVICES

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. The extent of wiring device work is indicated by drawings, schedules and specifications. Wiring devices are defined as single discrete units of the electrical distribution system which are intended to carry but not utilize electric energy.
- B. Types of electrical wiring devices in this section include the following:
 - Receptacles.
 - Switches.
 - Device plates.
 - Energy Control Devices

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's data on electrical wiring devices.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type of wiring device):
 - Legrand Co.
 - Hubbell, Inc.
 - Leviton Mfg. Co.
 - Lutron Electronics Co., Inc.
 - Cooper Wiring Devices
 - Square D Co.
 - Eaton Corp.
 - Siemens

2.2 FABRICATED WIRING DEVICES

- A. Provide factory fabricated wiring devices, in types, styles, colors, and electrical ratings for applications indicated and complying with NEMA Standards Pub. No. WD 1. Where types and grades are not indicated, provide proper selection as determined by Installer to fulfill wiring requirements, and complying with NEC and NEMA Standards for wiring devices. Provide brown color devices and wall plates except as otherwise selected; color selection to be verified by Contractor with Architect/Engineer.

2.3 RECEPTACLES

- A. Heavy-Duty Simplex: Provide single-duty type receptacles, 2 pole, 3 wire grounding, with green hexagonal equipment ground screw, 20 amperes, 125 volts with metal plaster ears, side wiring, NEMA configuration 5-20R unless otherwise indicated.
- B. Heavy-Duty Duplex Standard Style: Provide extra heavy-duty industrial series duplex receptacles, 2 pole, 3 wire grounding type with green hexagonal equipment ground screw, 20 amperes, 125 volts with metal plaster ears, side wiring, NEMA configuration 5-20R unless otherwise indicated. Similar to Hubbell Series HBL Series, or approved substitute.
- C. Special Purpose Receptacles: Provide polarized grounding type special purpose receptacles of the required amperage and voltage ratings for the duty intended. Device shall include a green hexagonal equipment ground screw.
- D. Ground Fault Receptacle: Provide hospital grade heavy duty duplex receptacle, 2 pole, 3 wire grounding type with green hexagonal equipment, ground screw and integral ground fault circuit interrupter, UL rated Class A, Group 1, 20 amperes, 125 volts, 60 Hertz with metal plaster ears, side wiring, NEMA Configuration 5-20R. Device shall include solid state ground-fault sensing and signalling, with a 5 milliampere ground fault trip level, plus or minus 1 milliampere. Similar to Hubbell Cat. No. GFR8300H Series, or approved substitute.
 - 1. Whether indicated or not on the floor plans, the Electrical Contractor shall furnish and install GFI protected devices in commercial kitchen areas next to lavs, on rooftop equipment, on exterior walls; and as indicated by the N.E.C., it shall be the discretion of the Electrical Contractor to provide GFI receptacles or GFI circuit breaker.

2.4 SWITCHES

- A. Toggle Switch: Provide extra heavy duty, industrial series flush toggle, 1 pole, 2 pole, 3-way, 4-way AC quiet switch rated 20 amperes @ 120/277 volts with green hexagonal equipment ground screw, metal plaster ears, and side wired screw terminals. Similar to Hubbell Series HBL Series or approved substitute.
- B. Key Switch: Provide extra heavy duty, industrial, 1 pole, 2 pole, 3-way, 4-way barrel key locking switch rated at 20 AMPs @ 120/277 volts with green grounding screw, metal plaster ears and side wired screw terminals. The tumbler shall be a six-point cylinder type. All project keyed switches to be keyed alike. Similar to Hubbell 122*RKL series.

2.5 DEVICE PLATES

- A. Provide switch and receptacle outlet wall plates for wiring devices, of types, sizes, and with ganging and cut outs required by the devices being installed. Construct with metal screws for securing plates to devices; screw heads colored to match finish of plates; plates colored to match wiring devices to which attached. **All emergency receptacles to have red coverplates.** Provide device plates possessing the following additional construction features: **Receptacle outlet plates to be permanently marked with panel designation and circuit number on back side of plate.**

1. Metal Plates to be stainless steel of non-corrosive and non-magnetic 302 alloy, .032" nominal thickness. Plates shall have brushed satin finish.
- B. Weatherproof device plates shall have spring-hinged waterproof cap suitably configured for each application, including face plate gaskets and corrosion-resistant fasteners. Provide device plates possessing the following construction materials and finishes:
 1. Thermoplastic Plates with (clear polycarbonate) (reinforced thermoplastic) cover.
 2. Cast Aluminum Plates shall be die-cast, copper-free aluminum construction with a baked-on lacquer finish.
 3. Stainless Steel Plates shall have twin seal vinyl gaskets. Base plates, covers, hinge pins, springs and screws shall be Type 302 alloy with a brushed satin finish.

2.6 ENERGY CONTROL DEVICES (Occupancy Sensors)

A. Line Voltage:

1. Combination wall switch and sensor shall be Dual Technology Passive Infrared and Ultrasonic with a coverage of 180° for 20 feet. Device shall be suitable for 120/277 dual voltage operation. Device shall be similar to Sensor Switch Cat. No. WSD-PDT or approved substitute.
2. Ceiling sensor shall be Dual Technology Passive Infrared and Ultrasonic 360° coverage. Self Contained Relay Device shall be suitable for 120/277 Dual Voltage operation. Device shall be similar to Sensor Switch Cat. No. CMR-PDT or approved substitute.

B. Low Voltage:

1. Ceiling mounted sensor shall be Dual Technology Passive Infrared and Ultrasonic with 360° coverage up to 20 feet. Device accepts 12 to 24 volt AC or DC. Device shall be similar to Sensor Switch Cat. No. CM-PDT or approved substitute.
2. Sensor power pack shall be a low voltage power supply with an input of either 120 volts or 277 volts AC and an output of 24 volts DC @ 150 mA. Device shall contain a 20 AMP isolated load control relay. When relay is used, power supply output shall be reduced to 24 volts DC @ 114 mA. Device shall be similar to Sensor Switch PP-20 or approved substitute.

PART 3 – EXECUTION

3.1 INSTALLATION OF WIRING AND CONTROL DEVICES

- A. Install wiring devices as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate with other work, including painting, electrical box and wiring work, as necessary to interface installation of wiring devices with other work.

- C. Install wiring devices only in electrical boxes which are clean, free from building materials, dirt and debris.
- D. Provide electrical connections for wiring and control devices.
- E. Delay installation of all wiring and control devices until wiring work is completed.
- F. Isolated Ground Receptacle Devices shall be connected to the system ground by way of an insulated ground conductor color coded green with a yellow stripe.

3.2 PROTECTION OF WALL PLATES AND RECEPTACLES

- A. At time of Substantial Completion, replace those items which have been damaged, including those burned and scorched by faulty plugs.

3.3 GROUNDING

- A. Provide electrically continuous, tight grounding connections for wiring and control devices.

3.4 TESTING

- A. Prior to energizing circuitry, test wiring devices for electrical continuity and proper polarity connections. After energizing circuitry, test wiring devices to demonstrate compliance with requirements.
- B. After energizing circuitry, the Electrical Contractor shall test and adjust all control devices to provide optimum operation and performance.

END OF SECTION 26 01 40

SECTION 26 01 55

MOTOR STARTERS

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of motor starter work is indicated by drawings, schedules and specifications.
- B. Refer to sections of other divisions of these specifications for driven equipment specified without motor starters. Motor starters for such equipment are the work of this section.
- C. Types of motor starters in this section include the following:
 - Manual.
 - Magnetic Full Voltage, Non-Reversing.
 - Combination Disconnect Switch and Magnetic Starter.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's data on motor starters and accessories.

1.3 COORDINATION

- A. The drawings and details there upon are scheme and/or diagrammatic in nature, and indicate the need and intent of the design. These are to be used for general guidance only. It shall be the responsibility of the Electrical Contractor to coordinate with other Division subcontractors, the installation of all motor starters, the need for control devices including the wiring and conduit, to and from the device.
- B. This coordination shall be carried out prior to actual installation. This shall be done to eliminate the possibility of conflicts between trades on items such as access, clearances and maintenance issues that may arise after completion of coordination.
- C. During the coordination phase of the project, the Electrical Contractor shall consult with Division 1 thru 23 subcontractors with regard to base design equipment characteristics. Any differences from the electrical plans and specifications shall be considered a change. The trade's contractor making the change at no additional cost to the Owner or delay in project completion shall handle these additional costs.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type and rating of motor starter):

Allen-Bradley Co.
 Cutler Hammer Products
 Furnas Electric Co.
 General Electric Co.
 Square D Co.
 Siemens

2.2 MOTOR STARTERS

- A. Provide motor starters and ancillary components; of types, sizes, ratings and electrical characteristics indicated which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installations.
- B. Fractional HP Manual Motor Starters: Provide manual, single phase, fractional HP motor starters for each motor rated less than 1/2 HP, of types, ratings and electrical characteristics indicated. Equip unit with thermal overload relay for protection of 120 volt AC motors. Provide starters with quick-make, quick-break, trip free toggle mechanisms, selector switches for hand-off-automatic control; mount starter in NEMA Type 1 or Type 4 enclosure as indicated or required by the NEC.
- C. Magnetic Motor Starter: Provide magnetic full voltage, non-reversing starters for each motor rated 1/2 HP and more of types, ratings and electrical characteristics indicated; equip with solid state overload relays, control transformers with 120V secondary, with one secondary fuse and one grounded secondary lead, two normally open and two normally closed auxiliary contacts, hand-off- automatic selector switch, red and green pilot lights wired and mounted through front of the enclosure. Mount starter in NEMA Type 1 or Type 4 enclosure as required by the NEC.
- D. Combination Disconnect Switch Magnetic Starter: Provide full-voltage, non-reversing, combination non-fused disconnect switch and magnetic starter for each motor rated 1/2 horsepower and more, of types, ratings and electrical characteristics indicated; equip with solid state overload relays, control transformer with 120 volt secondary, one secondary fuse and one grounded secondary lead, two normally open and two normally closed auxiliary contacts, hand-off- automatic switch, red and green pilot lights wired and mounted through the front of the enclosure. Mount starter in NEMA Type 1 or Type 4 enclosure as required by the National Electrical Code (NEC).
- E. Three (3) phase, full voltage, non-reversing magnetic motor starters, horsepower rating with minimum NEMA size #0 shall be as follows:

NEMA Size	Continuous Rating	Maximum Horsepower	
		208 Volt	480 Volt
0	18 AMPs	3HP	5HP
1	27 AMPs	7-1/2HP	10HP

2	45 AMPs	10HP	25HP
3	90 AMPs	25HP	50HP
4	135 AMPs	40HP	100HP
5	270 AMPs	75HP	200HP

Motor full-load current shall not exceed continuous ampere rating of starter.

PART 3 – EXECUTION

3.1 INSTALLATION OF MOTOR STARTERS

- A. Install motor starters in accordance with manufacture's written instructions, applicable requirements of NEC, NEMA Standards, and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. The Electrical Contractor shall consult and cooperate with the Control Contractor in assisting him in making control connections to the automatic position of the selector switch and to the auxiliary contacts.
- C. Motor Data: Before installing wiring for motors and starters, the Electrical Contractor shall consult the respective parties furnishing the equipment and obtain from them all data necessary to properly connect the apparatus, and for selection of thermal overload relays in accordance with motor nameplate. Any variance in loads or electrical characteristics from the contract drawings should be reported to the Engineer before proceeding with the work.
- D. When packaged equipment is furnished, all unit starters shall be furnished, mounted and wired by the installing contractor. The Electrical Contractor shall furnish and install a disconnect switch, as specified in Section 260170, and wire between unit's main terminal block and the disconnect switch.
- E. When packaged rooftop equipment is furnished, the unit disconnect switch and all starters shall be furnished, mounted and wired by the installing contractor. The Electrical Contractor shall wire between the line side of the disconnect switch and the building system.
- F. Provide connections for motor starters.

3.2 ADJUST AND CLEAN

- A. Inspect operating mechanisms for malfunctioning and where necessary adjust units for free mechanical movement.
- B. Touch-up scratched or marred surfaces to match original finish.

3.3 FIELD QUALITY CONTROL

- A. Subsequent to wire/cable hookup, energize motor starters and demonstrate functioning of equipment in accordance with requirements.

END OF SECTION 26 01 55

SECTION 26 01 60

PANELBOARDS

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of panelboard load-center and enclosure work, including cabinets and cutout boxes, is indicated by drawings and schedules.
- B. Types of panelboards and enclosures in this section include the following:

Lighting and Appliance Panelboards.
Distribution Panelboards.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's data including specifications, installation instructions and general recommendations, for each type of panelboard required. Include data substantiating that units comply with requirements.
- B. Shop Drawings: Submit dimensioned drawings of panelboards and enclosures showing layouts of enclosures and required individual panelboard devices, including by not necessarily limited to, circuit breakers, contactors, and accessories, including wiring diagrams of contactors.

1.3 COORDINATION

- A. The drawings are scheme and/or diagrammatic in nature, and indicate the need and intent of the design. These are to be used for general guidance only. It shall be the responsibility of the Electrical Contractor to coordinate, with other Division Subcontractors, the installation of all raceways, raceway supports, junction boxes and required fittings. This coordination will include conduit layout to allow access to equipment for maintenance.
- B. This coordination shall be carried out prior to actual installation; this shall be done to eliminate the possibility of conflicts between trades on items such as access, clearances and maintenance issues that may arise after completion of construction.
- C. Should the coordination not be carried out prior to installation, and a conflict exists, the installing contractor shall remove and reinstall the equipment as required to clear the conflict at no additional cost to the Owner and no delay in project completion.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type of panelboard and enclosure):

Cutler Hammer, Inc. (Eaton)
General Electric Company
Square D Company
Siemens

2.2 PANELBOARDS

A. General:

1. Panelboards shall comply with the following industry standards:
 - a. UL Listing/Approval
 - b. UL Standards:
Panelboards - UL67
Cabinet & Boxes - UL50
 - c. National Electric Code
 - d. NEMA Standard -PBI
2. Interiors:
 - a. All interiors shall be completely factory assembled. They shall be so designed that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors, so that circuits may be changed without machining, drilling and tapping.
 - b. Branch circuits shall be arranged using double row construction. A nameplate shall be provided listing panel type and rating.
 - c. Unless otherwise noted, full size insulated neutral bars shall be included. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Neutral bussing shall have a suitable lug for each outgoing feeder requiring a neutral connection. A ground bus will be included in all panelboards.
3. Boxes: Boxes shall be a minimum 20 inches wide and manufactured from galvanized steel. Provide minimum gutter space in accordance with the National Electric Code.
4. Trim:
 - a. Switching device handles shall be accessible. Panel access doors shall not uncover any live parts. Doors shall have flush type cylinder lock and catch except doors over 48" in height shall have auxiliary fastenings top and bottom of door in addition to the flush type cylinder lock and catch. Panelboard trim clamps shall be of the indicating type. Upon removal of screws behind door, the panel interiors become service accessible via piano hinged trim front.
 - b. Panel access door hinges shall be concealed. All locks shall be keyed alike; directory frame shall be welded metal and having a transparent cover shall be furnished with each door.

- c. All exterior and interior steel surfaces of the trim shall be properly cleaned, primed with a rust inhibiting phosphatized coating and finish with a gray ANSI 61 paint. Trims for flush panels shall overlap the box for a least 3/4 inch all around. Surface trims shall have the same width and height as the box. Trims shall be mountable by a screwdriver and without the need for special tools.
5. Main Bus and Branch Circuits: All main bus bars shall be full size aluminum, sized in accordance with U.L. standards to limit the temperature rise on any current carrying part to a maximum of 50 degrees C above an ambient of 40 degrees C maximum.
- B. Distribution Panelboards:
1. Panels shall be provided with molded case circuit breakers tested and U.L. labeled per U.L. 489.
 2. Circuit breakers 100 ampere through 400 ampere frame sizes shall be thermal-magnetic trip with inverse time current characteristics.
 3. Where multiple pole circuit breakers are indicated, provide with common trip so overload on one pole will trip all poles simultaneously. Molded case circuit breakers shall have a minimum 22,000 symmetrical RMS interrupting capacity at 240 volts.
- C. Lighting and Appliance Panelboards:
1. Provide switching and protective devices in quantities, ratings, types indicated, with anti-turn solderless pressure type lug connectors approved for copper conductors. Circuit breakers shall be the bolt-on, molded case, thermal magnetic type, with toggle handles that indicate when tripped. Where multiple pole circuit breakers are indicated, provide with common trip so overload on one pole will trip all poles simultaneously.
 2. Panelboards for use at 240 volts AC maximum shall incorporate circuit breakers as shown rated at 10,000 A.I.C. symmetrical at 240 volts.
 3. Panelboards for use at 480/277 volts AC maximum shall incorporate circuit breakers as shown rated at 14,000 A.I.C. symmetrical at 480 volts.

PART 3 – EXECUTION

3.1 INSTALLATION OF PANELBOARDS

- A. Install panelboards and enclosures where indicated in contract documents and, in accordance with the equipment manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. Anchor enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secure.
- C. Provide all required electrical and grounding connections within the panelboards and enclosures.

- D. The Electrical Contractor shall furnish and install on the door within each enclosure, a circuit labeling identification system for all electrical panelboards. The system must satisfy the NEC Article No. 110-22. The directories shall be typed, NOT handwritten.

END OF SECTION 26 01 60

SECTION 26 01 70

MOTOR AND CIRCUIT DISCONNECTS

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of motor and circuit disconnect switch work is indicated by drawings and schedules.
- B. Types of motor and circuit disconnect switches in this section include the following:
 - Equipment disconnects.
 - Appliance disconnects.
 - Motor-circuit disconnects.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's data including specifications, installation instructions and general recommendations, for each type of motor and circuit disconnect switch required.

1.3 COORDINATION

- A. The drawings are scheme and/or diagrammatic in nature, and indicate the need and intent of the design. These are to be used for general guidance only. It shall be the responsibility of the Electrical Contractor to coordinate, with other Division Subcontractors, the installation of all motor and circuit disconnect switches, supporting hardware, including wiring and conduit, to and from the equipment. This coordination will include conduit layout to allow access to equipment for maintenance.
- B. This coordination shall be carried out prior to actual installation; this shall be done to eliminate the possibility of conflicts between trades on items such as access, clearances and maintenance issues that may arise after completion of construction.
- C. Should the coordination not be carried out prior to installation, and a conflict exists, the installing contractor shall remove and reinstall the equipment as required to clear the conflict at no additional cost to the Owner and no delay in project completion.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following (for each type of switch):
 - Cutler-Hammer, Inc. (Eaton)
 - General Electric Co.
 - Square D Company
 - Siemens

2.2 FABRICATED SWITCHES

- A. Safety Switches: Safety switches shall be of sizes noted on the drawings, fusible or non-fusible and contained in a general purpose enclosure. All switches shall be type HD and have quick-make, quick-break operation. All switches shall be of proper horsepower rating as applicable and have dual interlocks designed to interlock the switch box door with the switch operating mechanism. Unit shall be provided with a suitable means of interlock release. An arrangement shall be provided for locking the operating handle in the "ON" or "OFF" position. Safety switches shall have the proper type metal enclosure, i.e., standard, weatherproof, etc., to suit their specific location as required by the National Electrical Code.
- B. Fuses: Provide fuses for safety switches, as recommended by switch manufacturer, of classes, types and ratings needed to fulfill electrical requirements for service indicated.
- C. When packaged rooftop equipment is furnished, the unit disconnect switch shall be furnished, mounted and wired by the installing contractor.
- D. When rooftop exhaust fans rated less than 1/2 HP at 120 volts, single phase, are furnished, except utility sets, the unit disconnect switch shall be furnished, mounted and wired by the installing contractor.

PART 3 – EXECUTION

3.1 INSTALLATION OF MOTOR AND CIRCUIT DISCONNECT SWITCHES

- A. Install motor and circuit disconnect switches where indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure that products fulfill requirements.
- B. Install disconnect switches used with motor-driven appliances, and motors and controllers within sight of controller position unless otherwise indicated.
- C. Provide electrical connections for motor and circuit disconnect switches.

END OF SECTION 26 01 70

SECTION 26 01 80

OVERCURRENT PROTECTIVE DEVICES

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of overcurrent protective device work is indicated by drawing schedules and specifications.
- B. Types of overcurrent protective devices in this section include the following:
 - 1. Molded case circuit breaker.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's data on overcurrent protective devices, including: voltages and current ratings, interrupting ratings, current limitations, internal inductive and non-inductive loads, time-current trip characteristic curves, and mounting requirements.
- B. Shop Drawings: Submit layout drawings of overcurrent protective devices, showing spatial relationships of units to associated electrical equipment, and connections to electrical power supplies.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include the following:
 - 1. Circuit-Breakers
 - Cutler-Hammer, Inc. (Eaton)
 - General Electric Co.
 - Square D Co.
 - Siemens

2.2 CIRCUIT BREAKERS

- A. Except as otherwise indicated, provide circuit breakers and ancillary components, of types, sizes, ratings and electrical characteristics indicated, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, as required for a complete installation.
- B. Molded-Case Circuit Breakers: Provide factory assembled, molded-cased circuit breakers of frame size indicated; 120/208 volts, and 277/480 volts 60 Hertz, one, two, or three poles

with a short circuit symmetrical ampere interrupting rating as indicated by the panel schedule and/or as shown by the single line riser diagram. Provide circuit breakers with permanent thermal instantaneous magnetic trips in each pole with ampere ratings as indicated. Construct with overcenter, trip-free, toggle type operating mechanisms with quick-make, quick-break action and positive handle trip indication. Construct devices for mounting and operating in any physical position and operating in an ambient temperature of 40 degrees C. Provide circuit breakers with mechanical screw type connector lugs, AL/CU rated.

PART 3 – EXECUTION

3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES

- A. Install overcurrent protective devices as indicated in contract documents, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC Standards for Installation of overcurrent protective devices.
- B. Coordinate with other work, including electrical wiring work, as necessary to interface installation of overcurrent protective devices with other work.
- C. Fasten circuit breakers without causing mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cabling.

3.2 ADJUST AND CLEAN

- A. Inspect circuit-breaker operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

3.3 FIELD QUALITY CONTROL

- A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

END OF SECTION 26 01 80

SECTION 26 01 90

SUPPORTING DEVICES

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. Types of supports, anchors, sleeves and seals specified in this section include the following:

Hangers.
Riser Clamps.
C-clamps
I-beam clamps.
One-hole conduit straps.
Two-hole conduit straps.
Round steel rods.
Lead expansion anchors.
Toggle bolts.
U-Channel Strut Systems.

PART 2 – PRODUCTS

2.1 MANUFACTURED SUPPORTING DEVICES

- A. Provide supporting devices, complying with manufacturer's standard materials, design and construct in accordance with published product information, and as required for a complete installation, and as herein specified.
- B. Supports: Provide supporting devices of types, sizes and materials having the following construction features:

Hangers: For supporting EMT conduit, electro-galvanized steel, with 1/4" minimum diameter hole for round steel rod; approximately MSS types 5, 7, 9 or spring steel conduit clips.

Reducing Couplings: Steel rod reducing coupling, 1/4" minimum black steel.

C-Clamps: Black malleable iron, 1/4" minimum rod size.

I-Beam Clamps: Black steel, 1-1/4" x 3/16" stock; 3/8" cross bolt; flange width 2"; approx. 52 pounds per 100 units.

One-Hole Conduit Straps: For supporting EMT conduit, electro- galvanized steel.

Two-Hole Conduit Straps: For supporting EMT conduit, electro-galvanized steel; 3/4" strap width; and 2-1/8" between center of screw holes.

Hexagon Nuts: For 1/4" rod size; galvanized steel.

Round Steel Rod: Black steel; 1/4" min. dia.

Offset Conduit Clamps: For supporting rigid metal conduit; black steel.

- C. Anchors: Provide anchors of types, sizes and materials indicated; and having the following construction features:

Lead Expansion Anchors: 1/4" - 20 Minimum .

Toggle Bolts: Springhead; 3/16 x 4".

- D. Manufacturer: Subject to compliance with requirements, provide anchors of the following:

Ackerman Johnson Fastening Systems, Inc.
Elcen Metal Products Co.
Ideal Industries, Inc.
Rawlplug Co., Inc.
Star Expansion Co.
U.S. Expansion Bolt Co.
Erico Products, Inc. (Caddy)

- E. U-Channel Strut Systems: Provide U-channel strut system for supporting electrical equipment, 16-gauge hot dip galvanized steel, construct with 9/16" dia. holes, 8" o.c. on top surface, with standard hot dip galvanized finish, and with the following fittings which mate and match with U-channel.

Beam clamps.
Thinwall conduit clamps.
Conduit hangers.
U-bolts.

- F. Manufacturers: Subject to compliance with requirements, provide channel systems of one of the following:

B-Line Systems, Inc.
Elcen Metal Products Co.
Power-Strut Div.; Van Huffel Tube Corp.
Unistrut Div.; GTE Products Corp.

PART 3 – EXECUTION

3.1 INSTALLATION OF SUPPORTING DEVICES

- A. Install hangers and anchors in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA, NEC and ANSI/NEMA for installation of supporting devices.
- B. Install hangers, supports, clamps and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together

on trapeze type hangers where possible. Install supports with maximum spacings.

END OF SECTION 26 01 90

SECTION 26 04 52

GROUNDING

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. Types of grounding in this section include the following:

Grounding:

Underground metal piping.
Underground metal water piping.
Grounding rods.
Service equipment.
Enclosures.
Systems.
Equipment.
Building Structural Steel (Bonding)

PART 2 – PRODUCTS

2.1 GROUNDING

- A. Except as otherwise indicated, provide each electrical grounding system indicated, with assembly of materials including, but not necessarily limited to, cables/wires, connectors, terminals (solderless lugs), and other items and accessories needed for complete installation. Where materials or components are not otherwise indicated, comply with NEC, NEMA, and established industry standards for applications indicated.
- B. Provide conduit, tube, duct, cable and fittings complying with Division 26 Basic Materials and Methods section, "Raceways", in accordance with the following listing:

Rigid steel conduit.
Electrical metallic tubing.
Flexible metal conduit.
Liquid-tight flexible metal conduit.
Rigid metal conduit fittings.
EMT fittings.
Flexible metal conduit fittings.
Liquid-tight flexible metal conduit fittings.

2.2 ELECTRICAL GROUNDING CONDUCTORS

- A. Unless otherwise indicated, furnish a green insulated equipment grounding conductor for all feeders and branch circuits, matching power supply wiring materials and sized according to NEC.

2.3 BONDING PLATES, CONNECTIONS, TERMINALS & CLAMPS

- A. Provide electrical bonding plates, connectors, terminals and clamps as recommended by bonding plate, connector, terminal and clamp manufacturers for applications.

2.4 GROUND RODS & PLATES

- A. Ground Rods: Steel with copper welded exterior, 3/4" dia. x 10'.

PART 3 – EXECUTION

3.1 INSTALLATION OF GROUNDING SYSTEMS

- A. Install electrical grounding systems in accordance with manufacturer's written instructions and with recognized industry practices to ensure grounding complies with requirements. Comply with requirements of NEC, NESC, NEMA and UL standards for installation of grounding systems.
- B. Coordinate with other electrical work as necessary to interface installation of grounding system with other work.
- C. Clamp cable connections to ground rods.
- D. Install bonding jumpers with ground clamps on water meter piping to electrically bypass water meter.
- E. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces, to ensure electrical conductivity and circuit integrity.

3.2 FIELD QUALITY CONTROL

- A. Upon completion of installation of electrical grounding system, test ground resistance with ground resistance tester. Where tests show resistance-to-ground is over 25 ohms, take appropriate action to reduce resistance to 25 ohms or less by driving additional ground rods and/or by chemically treating soil encircling ground rods with sodium chloride, calcium chloride, copper sulphate, or magnesium. Then retest to demonstrate compliance.

END OF SECTION 26 04 52

SECTION 26 04 60

TRANSFORMERS

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of transformer work is indicated by drawings and schedules.
- B. Types of transformers in this section include the following:

- Dry type transformers
- Pad-mounted, oil-filled transformers

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's data on power/distribution transformers, including certification of transformer performance efficiency at indicated loads, percentage regulation at 100% and 80% power factor, no-load and full-load losses in watts, % impedance at 75 Degrees C, hot-spot and average temperature rise above 40 degrees C ambient, sound level in decibels and standard published data including dimensions and net and shipping weights.
- B. Shop Drawings: Submit dimensioned drawings of transformer installations, showing mountings and supports.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type of transformer):

- Dry
 - General Electric
 - Sorgel Electric Division/Square D Company
 - Cutler-Hammer/Eaton Electrical, Inc.
 - The ABB Group
 - Siemens Energy & Automation, Inc.
 - Mirus International, Inc.
 - Approved Substitute.

2.2 POWER/DISTRIBUTION TRANSFORMERS

- A. General Requirements:
 - 1. Except as otherwise indicated, provide manufacturer's standard materials and components as indicated in contract documents and by published product information designed and constructed as recommended by manufacturer, and as required for complete installation.

2. All single phase transformers sized from 15 Kva thru 167 Kva shall be Energy Star rated and be compliant with NEMA Standard TP-1.
 3. All 3-phase transformers sized from 15 Kva thru 750 Kva shall be Energy Star rated and be compliant with NEMA Standard TP-1.
- B. Three Phase Distribution Transformers: Provide open ventilated dry- type three phase distribution transformers, 480 volt delta primary, 120/208 volt secondary, K-13 rated, with KVA rating as indicated on the drawings. Transformers shall be copper wound windings, 220°C Class insulation and temperature rise rating of 150 degrees C. Unit shall be provided with six (6) approximately 2-1/2% taps, two (2) above and four (4) below rated primary voltage. A low voltage neutral terminal shall be provided. Coils shall be enclosed by a sheet steel enclosure comprised of readily removable sections having ventilated openings in front cover. Core and coil assemblies shall be mounted on rubber isolation pads. Limit terminal compartment to 75 degrees C. at full-rated load. Provide wiring connectors suitable for copper wiring. Cushion-mount transformers with external vibration isolation supports. Electrically ground core and coils to transformer enclosure by means of flexible metal grounding strap.

PART 3 – EXECUTION

3.1 INSTALLATION OF TRANSFORMERS

- A. Install transformers as indicated in contract documents, and complying with manufacturer's written instructions, applicable requirements of NEC, NEMA and IEEE Standards, and in accordance with recognized industry practices to ensure that products fulfill requirements.
- B. Install units on vibration mounts; comply with manufacturer's installation method if any.

3.2 GROUNDING

- A. Provide tightly fastened equipment grounding and bonding connections for transformers.

3.3 TESTING

- A. Upon completion of installation of transformers, energize primary circuit at rated voltage and frequency from normal power source and test transformers, including, but not limited to, audible sound levels, to demonstrate capability and compliance with requirements. Where possible, correct malfunction units at the site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

END OF SECTION 26 04 60

SECTION 26 04 70

DISTRIBUTION CIRCUITS

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. Distribution circuit work is indicated by drawings and schedules.
- B. The distribution circuits shall include furnishing and installing a complete wire and conduit system between distribution panelboards and branch circuit panelboards.
- C. Types of equipment to be furnished and installed in this section include the following:

- Rigid Metal Conduit
- Intermediate Metal Conduit (IMC)
- Electrical Metallic Tubing (EMT)
- Wires and Cables
- Junction Boxes
- Pull Boxes
- Conduit Bodies
- Bushings
- Locknuts
- Supporting Devices

PART 2 – PRODUCTS

2.1 DISTRIBUTION CIRCUITS

- A. Furnish and install each distribution circuit indicated, with assembly of materials, including but not necessarily limited to, conduit, wire, pull boxes, junction boxes and other items and accessories needed for a complete installation. Where materials or components are not otherwise indicated, comply with NEC, NEMA and established industry standards for applications indicated.

PART 3 – EXECUTION

3.1 INSTALLATION OF DISTRIBUTION CIRCUITS

- A. Install distribution circuits complying with equipment manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation", and in accordance with recognized industry practices.
- B. Multiple circuits within a single raceway shall not be permitted under this section.

END OF SECTION 26 04 70

SECTION 26 04 71

FEEDER CIRCUITS

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. Feeder circuit work is indicated by drawings and schedules.
- B. The feeder circuits shall include furnishing and installing a complete wire and conduit system between distribution panelboards and major 3 phase loads, between power panels and 3 phase motor loads.
- C. Types of equipment to be furnished and installed in this section include the following:

- Rigid Metal Conduit
- Electrical Metallic Tubing (EMT)
- Intermediate Metal Conduit (IMC)
- Wires and Cables
- Junction Boxes
- Pull Boxes
- Conduit Bodies
- Bushings
- Locknuts
- Supporting Devices

PART 2 – PRODUCTS

2.1 FEEDER CIRCUITS

- A. Furnish and install each feeder circuit with assembly of materials, including but not necessarily limited to, conduit, wire, pull boxes, junction boxes and other items and accessories needed for a complete installation. Where materials or components are not otherwise indicated, comply with NEC, NEMA and established industry standards for applications indicated.

PART 3 – EXECUTION

3.1 INSTALLATION OF FEEDER CIRCUITS

- A. Install feeder circuits, complying with equipment manufacturer's written instructions, applicable requirements of NEC, NEMA and NECA's "Standard of Installation", and in accordance with recognized industry practices.
- B. Multiple circuits within a single raceway shall not be permitted under this section.

END OF SECTION 26 04 71

SECTION 26 04 72

BRANCH CIRCUITS

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. Branch circuit work is indicated by drawings.
- B. The branch circuits shall include furnishing and installing a complete wire and conduit or cable system between panelboards and lighting fixtures, receptacles, fractional horsepower motors, and small single phase loads.
- C. Types of equipment to be furnished and installed in this section include the following:

- Rigid Raceways – See Section 260110
- Electrical Metallic Tubing (EMT)
- MC (Metal Clad) (Concealed Work only)
- Wires and Cables
- Junction Boxes
- Pull Boxes
- Conduit Bodies
- Bushings
- Locknuts
- Supporting Devices

PART 2 – PRODUCTS

2.1 BRANCH CIRCUITS

- A. Furnish each branch circuit with an assembly of materials, including but not necessarily limited to, conduit, wire, cable, pull boxes, junction boxes and other items and accessories needed for a complete installation. Where materials or components are not otherwise indicated, comply with NEC, NEMA and established industry standards for applications indicated.

2.2 CONVENIENCE BRANCH CIRCUITS

- A. Intent:
 - 1. The intent of this portion of the specifications is to describe the requirements of a convenience circuit as it applies to 120-volt receptacles.
 - 2. All convenience branch circuits may consist of more than one 120 volt receptacle.
- B. Convenience Circuit - General: A circuit consisting of a phase and neutral conductor, which may share its neutral with other phase conductors provided that the neutral conductor does not become overloaded due to circuit phase relationship. This type of circuit shall also include an equipment grounding conductor as described under the grounding section of the specifications.

- C. Convenience Circuit - Dedicated: A circuit consisting of a phase and neutral conductor which DOES NOT share conductors with any other circuits. This type of circuit shall also include an equipment grounding conductor as described under the grounding section of the specifications.
- D. Convenience Circuit Dedicated with Isolated Ground: A circuit consisting of a phase, neutral and ground conductor which DOES NOT share conductors with any other circuits. This type of circuit shall also include an equipment grounding conductor as described under the grounding section of the specifications.
 - 1. The isolated ground conductor shall be connected to an isolated ground type receptacle as described under the Wiring Devices Section of the specifications.
 - 2. The isolated ground conductor shall be identified by green insulation with a yellow stripe.
 - 3. The isolated ground conductor shall be connected to an isolated ground bar in the branch circuit panelboard. This isolated ground bar shall then be connected to an applicable derived system ground or service entrance ground.

PART 3 – EXECUTION

3.1 INSTALLATION OF BRANCH CIRCUITS

- A. Install branch circuits, complying with equipment manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation", and in accordance with recognized industry practices.
- B. Multiple circuits within a single raceway or cable shall be permitted under this section. It shall be the responsibility of the Electrical Contractor to assure that the neutral conductors do not become overloaded due to circuit phase relationship, and isolated grounds not become voided or compromised due to miswiring or wrong connections.
- C. The Electrical Contractor may elect to use metal clad cable in lieu of electrical metallic tubing (EMT) in wall cavities, and/or above tile or dry wall ceilings. In all areas of exposed construction, electrical metallic tubing (EMT) shall be installed.

END OF SECTION 26 04 72

SECTION 26 04 75

ELEVATOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. Elevator electrical work is indicated by drawings, schedules and specifications.
- B. The feeder circuits, branch circuits and fire alarm interface shall include, but not be limited to, furnishing and installing a complete wire and conduit system with required equipment and components. This shall occur between the building's distribution panelboard, branch circuit panelboard, the fire alarm control panel and the elevator equipment, machine room, hoistway and elevator lobby.
- C. Types of equipment to be furnished and installed in this section shall include, but not be limited to, the following:
 - 1. Lighting (branch circuits)
 - 2. Power (feeder circuits)
 - 3. Control (fire alarm system)
 - 4. Signal (telephone system) (when required)

PART 2 – PRODUCTS

2.1 LIGHTING

- A. Furnish and install within the elevator machine room on strike side of machine room door, a 30 amp, 2 pole fused disconnect switch with conduit and wire to a junction box in the hoistway, final location of junction box shall be as directed by the elevator contractor.
- B. The non-fused disconnect switch shall be connected to the local branch circuit panelboard with 2 # 12 + 1 # 12 ground in ¾" conduit. This circuit shall be used to provide service to the elevator car lighting, exhaust fan and any other small loads required by the elevator equipment.

2.2 POWER

- A. Furnish and install within the elevator machine room on strike side of machine room door, a 200 amp, 3 pole fused disconnect switch with auxiliary contacts, with conduit and wire to the elevator controller, refer to the single line diagram for conduit and wire size. Fuse type and size shall be as directed by the elevator manufacturer. The auxiliary contacts shall be used to disconnect the control panel's battery backup during maintenance.
- B. Furnish and install within the distribution panelboard a 3 pole molded case circuit breaker with a shunt trip device, auxiliary contact and conduit and wire to the elevator disconnect switch. Refer to the single line diagram for the circuit breaker size and type and the conduit and wire size. The auxiliary contacts shall be used to disconnect the control panel's battery backup.

- C. Furnish and install a 20 amp, 120 volt, single phase power source for the molded case circuit breaker's shunt trip device from a local branch circuit panelboard.

2.3 CONTROL

- A. Furnish and install smoke detectors within areas of the building associated with the elevator as follows:
 - 1. Elevator Lobbies one on each level
 - 2. Hoistway at the top of the shaft. In addition to the smoke detector, furnish and install a heat detector (when the building is sprinkled).
 - 3. Machine Room in addition to the smoke detector, furnish and install a heat detector (when the building is sprinkled).
- B. Each elevator lobby, hoistway and machine room smoke detector shall be zoned separately from each other and from the floor detectors. These detectors shall be wired and programmed to form a three (3) circuit control scheme for elevator recall as outlined in the National Fire Alarm Code 3-8.14.6.
- C. When the building is sprinkled the elevator machine room and the elevator hoistway shall have a heat detector installed. This detector shall be installed within 2 feet of the sprinkler head in accordance with the National Fire Alarm Code 3-8.15.2. The heat detector shall be furnished based on the Response Time Index (RTI) of both the heat detector and the sprinkler head. This detector shall be wired to the fire alarm control panel to provide for elevator shutdown in accordance with the National Fire Alarm Code 3-8.15.
- D. Furnish and install a shunt trip device and auxiliary contact with power source on the elevator molded circuit breaker located in the distribution panelboard. When the building is sprinkled this device shall be wired to the fire alarm control panel in accordance with ANSI/ASME A17.1 – 1996, Rule 102.2 (C) and National Electrical Code 620-51.

2.4 COMMUNICATIONS

- A. Furnish and install a four (4) pair, Cat 5 cable in ¾" conduit between the telephone terminal backboard and a junction box located in the elevator hoistway. Final location of the junction box shall be as directed by the elevator contractor.

PART 3 – EXECUTION

3.1 INSTALLATION OF ELEVATOR ELECTRICAL SYSTEMS

- A. Install equipment and components, complying with equipment manufacturer's written instructions, applicable requirements of the National Electrical Code (NEC), NEMA and NECA's "Standard of Installation", and in accordance with recognized industry practices.

3.2 CONTROL WIRING

- A. The Electrical Contractor shall furnish and install all required wiring between the fire alarm control panel and the elevator controller to provide for elevator recall when the building has an alarm condition. This contractor shall consult and cooperate with the elevator installing contractor.
- B. The Electrical Contractor shall furnish and install all required wiring between the fire alarm control panel and the smoke detectors in the elevator lobbies, and the smoke and heat detectors in the elevator machine room and hoistway. This contractor shall consult and cooperate with the fire alarm manufacturer in providing the required programming and wiring needed to complete the recall system as required by the Elevator Code, NEC, NFPA and the NATIONAL FIRE ALARM CODE.
- C. The Electrical Contractor shall furnish and install all required wiring between the fire alarm control panel and the shunt trip circuit breaker located in the distribution panel. This wiring and programming shall provide for the trip signal from the fire alarm control panel and a supervisory signal to the fire alarm control panel as “TROUBLE” for the loss of the trip power source. This wiring and programming shall be in accordance with the requirements of the NEC and the NATIONAL FIRE ALARM CODE.

3.3 POWER WIRING

- A. The Electrical Contractor shall furnish and install an elevator circuit breaker in the distribution panel of the size and type as indicated on the single line diagram. This circuit breaker shall be complete with a shunt trip device rated 120 volt A.C and auxiliary contact. The shunt trip device shall be wired to an external 120 volt power source in a local branch circuit panel with a 20 amp – 1 pole circuit breaker and 2 # 12 + 1 # 12 ground in ¾” conduit. Trip control and supervisory shall be furnished and installed as indicated above under 3.1 paragraph “C”.
- B. The Electrical Contractor shall furnish and install within the elevator machine room a fused elevator disconnect switch of the size and type indicated on the single line diagram. This disconnect switch shall be furnished with an auxiliary contact and wired to the elevator controller’s “optional” battery system for disconnect and shutdown. If the “optional” battery system is not selected then the auxiliary contact remains un-wired. All required wiring shall be in accordance with the requirements of the NEC and the ELEVATOR CODE. The Electrical Contractor shall consult and cooperate with the elevator installer in providing this function.
- C. The Electrical Contractor shall furnish and install a 30 amp, 1 pole fused disconnect switch within the elevator machine room. This switch shall provide power to the elevator car lighting and exhaust system, the switch shall be connected to the elevator equipment in accordance with the elevator contractor’s requirements. The switch shall be connected to a local branch circuit panel with a 20 amp – 1 pole circuit breaker and 2 # 12 + 1 # 12 ground in ¾” conduit.

3.4 COMMUNICATION WIRING

- A. The Electrical Contractor shall furnish and install one (1) four pair, CAT-5 cable in $\frac{3}{4}$ " conduit between the elevator equipment and the building's telephone system. The Electrical Contractor shall consult and cooperate with the Elevator Contractor in making this connection.

END OF SECTION 26 04 75

SECTION 26 05 10

BUILDING LIGHTING

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. Lighting fixture work is indicated by specifications, drawings and schedules.
- B. Types of lighting fixtures in this section include the following:
 - 1. Fluorescent.
 - 2. Incandescent.
 - 3. High Intensity Discharge.
 - 4. LED
- C. Applications of lighting fixtures required for the project include the following:
 - 1. General Lighting.
 - 2. Supplementary Lighting.
 - 3. Emergency Lighting.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's data on building lighting fixtures.
- B. Shop Drawings: Submit dimensioned drawings of lighting fixture installations, including but not necessarily limited to, layout, relation to associated panelboards, and connections to panelboards. Submit fixture shop drawings in booklet form with separate sheet for each fixture, assembled in luminaire "type" alphabetical order, with proposed fixture and accessories clearly indicated on each sheet.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with project specifications and requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 - 1. Refer to "Lighting Fixture Schedule", on the drawings, for fixture types and acceptable manufacturers.
- B. Each lighting fixture type specified represents a specific style and quality of fixture acceptable for this project. Equivalent manufacturers listed are consider to have lighting fixtures which meet or exceed those of the originally specified manufacturer.

- C. The Engineer reserves the right to reject any shop drawing and to request a resubmission should the contractor submit a shop drawing of an equivalent manufacturer which is viewed as being of an incompatible style or inferior quality.
- D. No fixture shop drawing shall be submitted, nor will any be accepted, for any manufacturer which is not specifically listed for that fixture type. When a fixture manufacturer is listed for a specific fixture type, this does not provide him with the right to submit for fixtures he is not listed under. A bidding Contractor may elect to submit non listed fixtures for the Engineer's review, a minimum of ten (10) working day prior to bid, if the Engineer agrees that the submitted fixture meets the intended design than a written addendum will be issued, if no addendum is issued than the manufacturer shall not submit shop drawings for that fixture type. The Engineer, and only the Engineer shall make the final decision on whether the submitted fixture meets the project's requirements.
- E. Should the Contractor be unable to obtain approval of the resubmitted manufacturer, than he should submit a fixture from one of the other equivalent manufacturers listed or from the originally specified manufacturer.

2.2 LIGHTING FIXTURES

- A. Provide lighting fixtures of the size, type and rating indicated complete with, but not necessarily limited to, housings, lamp holders, reflectors, ballast, lamps, mounting frames, pendants and wiring; wired and connected in place, complete, tested and left in satisfactory operating condition.
- B. Fluorescent Lamp Ballasts:

Section 1 - Physical Characteristics

1. The ballast shall be physically interchangeable with a standard core & coil electromagnetic ballast.
2. The electronic ballast shall be provided with integral leads, color coded to ANSI standard C82.11 (latest version).

Section 2 - Performance Requirement

1. The "High Frequency" electronic ballast shall operate lamps at a frequency of 20 KHz or higher without visible flicker.
2. The electronic ballast's input current shall have Total Harmonic Distortion (THD) of less than 20% when used with primary lamp.
3. The electronic ballast shall have a Power Factor greater than 98% when used with primary lamp.
4. The electronic ballast shall have Lamp Current Crest Factor of less than 1.7, in accordance with lamp manufacturers' recommendations and ANSI C82.11.

5. The electronic ballast shall support a sustained short to ground or open circuit of any output lead without damage to the ballast.
6. The electronic ballast shall have an audible noise rating of Class A or better.

Section 3 - Regulatory Requirements

1. Ballast shall meet the requirements of the Federal Communications Commission Rules and Regulations, Part 18, for non-consumer equipment.
2. The electronic ballast shall meet ANSI C82.11 standards regarding harmonic distortion.
3. Ballast shall meet ANSI C62.41 Cat. A for transient protection.
4. The electronic ballast shall comply with all applicable state and federal efficiency standards.
5. The electronic ballast shall be Underwriters' Laboratories (UL) listed (Class P) and CSA Certified where applicable.

Section 4 - Other

1. The electronic ballast shall not contain Polychlorinated Biphenyls (PCB's).
2. The electronic ballast shall carry a five year (5) warranty.

C. High Intensity Discharge Ballasts

Section 1 - Physical Characteristics

1. The ballast shall be either a open core and coil mounted within the fixture or an encapsulated core and core.
2. With both types the capacitor and the igniter are mounted separately within the fixture.

Section 2 - Performance Requirement

1. Where quiet performance is required the standard open core and coil shall be potted in a cube-shaped steel can utilizing Class H (180 Deg. C.) polyester compound.
2. Encapsulated ballasts shall carry a Class A noise rating up through 175 watts and Class B for 250 and 400 watts.
3. The ballast shall be designed with multiple input voltage taps on the primary coil. The four (4) tap design shall operate on 120 volt, 208 volt, 240 volt and 277 volt.

Section 3 - Regulatory Requirements

1. Ballast shall be Underwriters' Laboratories (UL) listed in accordance with UL 1029.

2. Ballast shall be designed and manufactured in accordance with ANSI C82.4.
- D. Fixture Lamps: For the type, number and color of the fixture lamps, refer to the Lighting Fixture Schedule on the drawings.

PART 3 – EXECUTION

3.1 INSTALLATION OF LIGHTING FIXTURES

- A. Install lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation", NEMA Standards and with recognized industry practices to ensure that lighting fixtures fulfill requirements of the project.
- B. Install lighting fixtures in removable tile ceilings using 3/8" flexible metal conduit with 3 # 12 awg. conductor. Maximum length of flexible lead shall not exceed 60". Flexible lead shall extend from the fixture to the junction box. The junction box shall be securely fastened to the building structure above the removable tile ceiling and shall not serve more than two (2) lighting fixtures, nor shall the junction box support any of the lighting fixtures.

3.2 LIGHTING FIXTURE MOUNTING

- A. 1' x 4', 2' x 2' and 2' x 4' fluorescent fixtures installed in a removable tile ceiling shall be installed using T-Bar grid safety clips as provided by the fixture manufacturer and as required by the NEC.
- B. 2'x 2' and 2' x 4' fluorescent fixtures installed in a removable tile ceiling shall be installed using support wires at all four corners of the fixture. The support wires shall be carried up to the building structure and securely anchored using screwed or bolted hardware. Pressure type clips will not be acceptable. The Electrical Contractor shall be responsible for installing or having installed these four (4) support wires.
- C. 1' x 4' fluorescent fixtures installed in a removable tile ceiling shall be installed using support wires at two (2) corners of the fixture. The support wires shall be carried up to the building structure and securely anchored using screwed or bolted hardware. Pressure type clips will not be acceptable. The Electrical Contractor shall be responsible for installing or having installed these Two (2) support wires.
- D. Incandescent and fluorescent downlights installed in a removable tile ceiling shall be installed using 24" spreader bars attached to the T-Bar grid system. Two (2) support wires shall be installed, one (1) on each side of the fixture and centered between the spreader bars, these support wires shall be carried up to building structure and securely anchored using screwed or bolted hardware. Pressure type clips will not be acceptable. The Electrical Contractor shall be responsible for installing or having installed these two (2) support wires.
- E. Pendant lighting fixtures, either chain, cable or stem hung below a removable tile ceiling shall be installed in accordance with fixture manufacturer's written instructions and recommendations. The Electrical Contractor shall furnish and install support wire or threaded rod from the fixture mounting hardware up to building structure and securely anchor using screwed or bolted hardware. Pressure type clips will not be acceptable. These

support devices shall be independent from the ceiling T-Bar grid system, the system may be used as a guide, but in no way shall the T-Bar grid system carry any of the weight produced by the fixture or it's support devices.

- F. Surface mounted fixtures installed on removable tile ceilings or dry wall ceilings shall be installed in accordance with fixture manufacturer's written instructions and recommendations.
 - 1. Fixtures installed on removable tile ceilings shall be anchored to the T-Bar grid system using snap-on clips with threaded studs and wing nuts. The Electrical Contractor shall furnish and install a support wire from each snap-on clip carried up to building construction and securely anchor using screwed or bolted hardware.
 - 2. Fixtures installed on dry wall ceilings shall be mounted using spring-loaded toggle bolts. The number and location of the anchors shall depend on the fixture manufacture's written instructions and recommendations. It shall be the responsibility of the Electrical Contractor to follow these instructions and recommendations.

3.3 ADJUST and CLEAN

- A. Clean lens, reflectors and interiors of all lighting fixtures of dirt and construction debris upon completion of installation.
- B. Protect installed lighting fixtures from damage during the remainder of the construction period.

3.4 FIELD QUALITY CONTROL

- A. Upon completion of the installation of the lighting fixtures, and after the building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with project requirements. Where possible, correct malfunctioning units at the site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.
- B. At the time of Substantial Completion, replace lamps in lighting fixtures which are observed to be noticeably dimmed after Contractor's use and testing, as judged by the Architect/Engineer. Furnish stock or replacement lamps amounting to 15% (but not less than one (1) lamp in each case) of each type and size used in each type of fixture. Deliver the replacement stock as directed to the Owner's storage area.
 - 1. Refer to Division 1 sections for the replacement/restoration of lamps in lighting fixtures, where used for temporary lighting prior to the time of Substantial Completion.
- C. Replace defective and burned out lamps for a period of one (1) year following the time of Substantial Completion.

3.5 GROUNDING

- A. Provide tight equipment grounding connections for each lighting fixture installation, in accordance with fixture manufacturer's recommendations and the NEC's requirements.

END OF SECTION 26 05 10

SECTION 26 55 31

STAGE LIGHTING SYSTEM

PART 1 - GENERAL

1.01 - RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Special Conditions and Division-1 Specification sections, apply to work specified in this section.

1.02 - RELATED WORK AND REQUIREMENTS

- A. Section 26 00 00

1.03 - SCOPE

- A. This section requires the fabrication, furnishing, delivery, installation and testing of the lighting system as indicated on the drawings and specified herein.
- B. The contractor shall provide all materials, equipment, labor, tools, scaffolds, and incidentals necessary to perform the scope of work.
- C. It is the intention of these specifications that the contractor provides a professional quality, complete and properly operating system in every respect and detail.
- D. The installation contractor shall examine the plans in detail to familiarize him with the scope of the work. Special attention shall be paid to reviewing all project electrical drawings, floor plans, conduit risers, and the like for locations and quantities of boxes and enclosures.
- E. The contractor shall assume full responsibility for a complete operating installation, in the required location, in accordance with the contract documents.
- F. Coordinate fully with the Division 26 Contractor.

1.04 - WORK INCLUDED

- A. Without restricting volume or generality of above "Scope," work to be performed under this section shall include, but not be limited to, the furnishing and installation of the following:
 - 1. Auditorium and Stage
 - a) A computer controlled dimming system with approximately 268 dimmers and 40 120V non dim circuits and 20 208-240V nondim circuits. The design shall incorporate two of house catwalk position, four front of house torm lighting positions, four on stage lighting battens, apron lighting, two onstage plugging boxes, eight on stage floor pockets one orchestra pit plugging box, and two concert ceilings. Lighting network receptacles shall be located at each of the previously listed lighting positions. There shall be three follow spotlights. The stage lighting system consists of the stage dimmer cabinets, non-dim panels, auxiliary racks, circuit distribution raceways, a fiber optic backbone, wire, DMX-512 computer based stage lighting console, video display, console plug-in stations, a backstage control panel, a mix of conventional, LED and moving head stage lighting fixtures, cables, accessories and spares. The system infrastructure will be network based.

- b) A separate house lighting dimmer rack with 24 dimmers shall be included. House Lighting Control shall consist of a backstage control station, a control booth control station, a control booth entry station and entry stations located at the auditorium exits
- B. The Contractor shall examine the plans in detail to familiarize himself with the scope of work.
- C. The Contractor shall provide the required manufacturers' shop drawings.
- D. The Contractor shall provide all the necessary specialty equipment for the complete lighting and dimming system installation as specified herein, and shown on the drawings.
- E. The Contractor shall coordinate the system control wire conduit and device locations with the Division 26 Contractor.
- F. The Contractor shall deliver to the job site, and coordinate the installation of, the specialty equipment with the Division 26 Contractor.
- G. The Contractor shall provide, install and terminate all system control wires.
- H. The Contractor shall provide and install all system control devices.
- I. The Contractor shall uncrate, assemble, lamp, hang and aim all the stage lighting fixtures as shown on the drawings.
- J. The Contractor shall provide for the system activation.
- K. The Contractor shall provide the system manuals.
- L. The Contractor shall provide the system warranty.
- M. It is the Contractor's responsibility to ensure that the system and all of the system components, fixtures, equipment, devices, wire, terminations, field assemblies (including custom assemblies), etc pass all required inspections by the local authority having jurisdiction.
- N. Procurement of all required permits.

1.05 - WORK NOT INCLUDED

- A. The following work, although in another section, has a significant impact on the scope of this work. The Contractor is responsible for the successful coordination of the following:
 - 1. System conduit.
 - 2. Installation and termination of Line supply.
 - 3. Installation and termination of Load wire.
 - 4. Dimmer rack installation.
 - 5. Distribution installation.

1.06 - CONTRACTOR'S QUALIFICATIONS:

- A. Only qualified contractors shall be used.
- B. The work of this section will be contracted to a single firm, referred to as the contractor.
- C. The contractor shall be a lighting system contractor who regularly engages in the furnishing, installation and servicing of systems of similar nature, size, scope and complexity to that contemplated by this specification. The contractor shall have done so for a period of not less than five years preceding the bid date.
- D. The contractor shall have maintained for the five years preceding the bid date, a suitably staffed and equipped service organization which has continuously offered maintenance and

- repair services for systems of the nature, size, scope and complexity to that contemplated by this specification.
- E. The contractor shall have on staff a factory trained field service agent, capable of system testing, commissioning and troubleshooting systems of the nature, size, scope and complexity to that contemplated by this specification.
- F. The contractor shall have on staff a qualified and competent lighting designer / engineer capable of designing systems of the nature, size, scope and complexity to that contemplated by this specification.
- G. The contractor shall maintain for the duration of this contract all required business and professional licenses and insurance.
- H. The contractor shall demonstrate to the satisfaction of the owner, through submittals presented in accordance with the project timetable, that the contractor meets all the above qualifications. The minimum contractor qualification submittal shall include the following:
1. Statement of company history. Include a breakdown by percentage of gross sales of all business activities the contractor is involved in for each of the last 5 years (e.g. system installation = 30%, expendable sales = 40%, equipment rentals = 20%, design and other professional services = 10%, etc).
 2. Previous experience: Furnish a list of four installations of the type and size contemplated by these specifications, currently in use as originally installed, in which a theatre / system consultant was involved, completed in the last 5 years and the following information regarding each installations:
 - a) Name and address of each installation facility.
 - b) Facility owner and telephone number.
 - c) Name, address, and phone number of a person regularly employed by the owner, who is familiar with the operation of the systems and who has no connection or business connections with the contractor except as the contractor shall fully disclose
 - d) Name, address, and phone number of the theatre / system consultant, along with the names of all the consultant's personal directly involved.
 - e) System shop drawing – These will be returned if the contractor provides a call tag or return postage.
 - f) Owner's manual drawing – These will be returned if the contractor provides a call tag or return postage.
 - g) System as-built drawings drawing – These will be returned if the contractor provides a call tag or return postage.
 - h) List of contractors personal involved with each persons responsibility on the project.
 - i) Name, address and phone number of the general contractor, along with the names of all key GC personal directly involved.
 - j) Name address and phone number of the electrical contractor, along with the names of all key EC personal directly involved.
 3. Statement of current company capabilities and ownership.

4. Key Personal: For each of the key personnel listed in the below; Include individual's name, title, and number of continuous years of service to contractor. Include a resume detailing industry experience, and role within organization (include only full-time/regular staff employees; not independent contractor, freelance, or temporary positions). List all industry certifications held, training courses attended, and continuing education credits, including dates of attendance.
 - a) Project Manager
 - b) Senior Technician
 - c) Service Manage
5. Factory Trained Field Service Agent. Include individual's name and title. List all factory held certifications, training courses attended, and continuing education credits, including dates of attendance. Provide a list of recently commissioned systems, scope of project, and commissioning dates.
6. Lighting Designer / Engineer. Include individual's name and title. List current design credits with scope of project, and design completion dates.
7. Other Department Staff. Include size of staff and experience of each staff member.
8. Replacement and Spare Parts Inventory – Provide detailed list of primary replacement parts, components, and spares typically held in inventory.
9. Test Equipment and Physical Plant – Include an inventory of all test facility equipment owned and used regularly by the Service Department. Provide description of physical plant and space utilization.
10. Copies of all business and professional licenses and insurance certificates.

PART 2 - PRODUCTS

2.01 - GENERAL

- A. Base Bid- Provide a complete system of dimming, distribution, control, fixtures, and accessories as specified herein and as manufactured and/or supplied by Electronic Theatre Controls of Middleton, WI. Bidders may bid equal systems and components by the other approved manufacturers specified herein as an Alternate to the Base Bid.
- B. When this document lists several alternative manufacturers for a particular item of equipment, more than one of which is to be provided, the Contractor shall furnish all of those similar items of equipment from one manufacturer.
- C. All ETC and Strand dimmer racks, dimmer modules, lighting controls and lighting consoles shall be from the same manufacturer.
- D. Any item of equipment or hardware that may not be specifically shown on the drawings or specified herein, but required for proper system operation or installation, shall be furnished and installed and be of the highest quality available.
- E. All materials and equipment used in this project shall be new, unused and of the latest models and design. Refurbished materials and equipment are not permitted except where noted.
- F. The performance of all equipment must meet the most recently published manufacture's data sheet
- G. UL Labels: All equipment, where applicable standards have been established, shall be listed by Underwriters' Laboratories, Inc., and shall bear UL label when delivered to the job.

- H. If so required by the local authority having jurisdiction, anything not arriving at the job bearing a UL label shall be field inspected and label by a nationally recognized testing laboratory recognized and approved by the local authority having jurisdiction.

2.02 - ALTERNATIVE MANUFACTURERS

- A. The stage lighting and control manufacturer shall be one who has been continuously engaged in the manufacture of stage lighting control equipment, wiring devices, and electronic dimmers for ten years or more.
- B. Except where otherwise noted in this specification, the following are the approved manufacturers for the listed respective products:

Electronic Theatre Controls, Inc.
3030 Laura Lane
Middleton, Wisconsin 53562
(800) 688-4116

Strand Lighting, Inc.
6603 Darian Way
Cypress, CA 90630
(714) 230-8200

Altman Lighting Inc.
57 Alexander Street
Yonkers, NY 10701
(914) 476-7987

LynTec
8401 Melrose
Lenexa, KA 66214
(913) 529-2233

Martin USA
700 Sawgrass Corporate Parkway
Sunrise, FL 33325
(954) 858-1800

SSRC
11 Freedom Court
Greer, South Carolina 29650
(864) 848-9770

LEX Products Corp.
401 Shippan Avenue
Stamford, CT 06902
(800) 643-4460

Middle Atlantic Products, Inc.
North Corporate Drive
Riverdale, NJ 07457

(973) 839-1011

Lycian Stage Lighting
PO Box D
Kings Hwy
Sugar Loaf, NY 10981-0214
(845) 469-2285

Strong Entertainment Lighting
4350 McKinley Street
Omaha, NE 68112
(402) 453-4444

Robert Juliat USA
48 Capital Dr.
Wallingford, CT 06492
(203) 294-0481

- C. Alternatives: In no case will equipment or materials of lesser design or workmanship be acceptable. Only those materials and equipment listed in this specification will be considered unless prior approval is sought and received.
1. Substitutions: When a specific piece of equipment specified has been discontinued and/or replaced by a new model, substitution will be acceptable when:
 - a) Submission of complete data on the new model or substitute has been approved by the owner prior to equipment acquisition.
 - b) Substitute equipment or the replacement of rejected equipment shall be at the sole expense of the contractor.
 2. Substitutes shall be considered only when they are submitted fourteen days prior to bid date, and are accompanied by sufficient catalog data, specifications, and technical information for evaluation.
 - a) Summarize proposal with a list of equipment catalog or series numbers. Substitute bids shall include a system riser diagram detailing components and any deviation of functionality from the drawings and specifications herein.
 - b) The bidder shall include the name, address, and phone number of at least two- (2) factory authorized Field Warranty centers within a 250-mile radius of the job site as a part of the submittal documents.
 - c) On the lighting fixtures, the bidder submitting other equipment shall include performance data taken and reported in compliance with the "Recommended Practice for Reporting Photometric Performance of Incandescent Filament Lighting Units used in Theatre and Television Production," approved as the official standard by the U.S. Institute for Theatre Technology, the Illuminating Engineering Society, the Society of Motion Picture and Television Engineers, and the American Theatre Association. For purposes of establishing the validity of such submissions, the manufacturer shall furnish this data from an independent testing laboratory. Proposals that fail to meet this requirement shall not be considered.
 - d) On the dimming system, the bidder submitting other equipment shall include pertinent performance data, charts and drawings showing in what respect the system will function in accordance with specification, and in what way it will deviate from the specification. This submittal shall include, but not be limited to the following:

- 1) Rated ampacity, peak single cycle surge current rating, I²t rating, and transient voltage rating of the output devices employed in the dimmers.
 - 2) Laboratory verification of minimum current rise time at a 90-degree conductive angle, with the dimmer operating at the maximum load.
 - 3) Description of the air-cooling and air filtration systems.
 - 4) Description of the packaging and ease of replacement for all spare parts required in this specification.
 - 5) Original Manufacturer's catalog data sheets for all major components of the dimmer system.
- e) On the control system, the bidder shall submit the name of the manufacturer, and list of ten (10) or more operating systems in the State of Delaware of the type specified which meet the performance control functions designed, with contact names and telephone numbers for references. This information shall be mandatory as a basis for determining the bidder's intent in meeting the full requirements of this specification, and shall be submitted at least fourteen days in advance of bidding.
- f) It is understood that any additions or revisions of wiring required by the use of substitute equipment, whether such wiring is part of this contract or of the prime electrical contract, shall be the responsibility of the bidder making the substitution.
- g) If required by the Owner, the Consultant, or Architect, the bidder shall provide working samples of substitute equipment including lamps for any lighting fixtures, to be delivered to the premises designated, for examination by Architects, Consultants, and such representatives as the Owner may direct. Handling, shipping and delivery to, or removal from site, of any sample required shall be at the cost of the Contractor. The Contractor shall be responsible for the arrangement of the cost of the electrical supply required to properly test any lighting instruments or item of equipment. Proposals which fail to address specification requirements or review comments will be rejected.
- h) Prior approval submittal review and approval shall not be considered to be shop drawing review. Prior approval in no way relieves the Contractor of responsibility to fully meet the requirements and intent of this specification.
- i) Should the contractor proposed and receive approval for the use of alternative or substitute equipment which requires additional or modified conduit, the contractor will be solely responsible for the installation of such conduit.

2.03 - AUDITORIUM AND STAGE DIMMER BANKS

- A. The dimmer rack shall be of modular design. The rack must be able to accept "slide in" dimmer modules and "slide in" control modules for easy installation and removal.
- B. Furnish the dimmer racks and related equipment from one of the following approved manufacturers or approved equal; see system one line drawing for quantities and device location drawing for placement
1. Electronic Theatre Controls, Inc.

<u>CAT. #</u>	<u>DESCRIPTION</u>
SR-48	Stage lighting dimmer rack. Sensor dimmer rack configured for 96, 20amp circuits.
DRd-12	House lighting dimmer rack. Unison dimmer rack configured for 24, 20amp circuits

2. Strand Lighting, Inc.

<u>CAT. #</u>	<u>DESCRIPTION</u>
76512	Stage lighting dimmer rack. C-21 dimmer rack configured for 96, 20amp circuits.
74121 A21-3 space and 74130- A21-9 space	House lighting dimmer racks configured for 24, 20amp circuits

2.04 - AUDITORIUM AND STAGE DIMMER MODULES

- A. The dimmers shall be of modular design for easy installation and removal. Each module to come equipped with two 2.4kw dimmers, magnetic circuit breakers and a sealed power device assembly. The sealed power device assembly must be field replaceable without soldering.
- B. Furnish the dimmer modules from one of the following approved manufacturers or an approved equal; see system one line for quantities.

1. Electronic Theatre Controls, Inc.

<u>CAT. #</u>	<u>DESCRIPTION</u>
D20	Stage lighting dimmer modules. Dual 20 amp status reporting dimmer modules for production dimming circuits
R20	Stage lighting relay modules. Dual 20 amp relay modules for production relay circuits
D20	One spare
D20	House lighting dimmer modules. Dual 20 amp dimmer modules for house light dimmers #1 thru 8
R20	House lighting relay modules.

	Dual 20 amp modules for house light dimmers #9 thru 16
CC20	House lighting constant current modules. Dual 20 amp modules for house light dimmers #17 thru 24
CC20	One spare
AFM	Furnish necessary quantities of Air flow modules

2. Strand Lighting Inc.

CAT. #	DESCRIPTION
76562	Stage lighting dimmer modules. Dual 20 amp dimmer modules for production dimming circuits
76566	Stage lighting relay modules. Dual 20 amp modules for production relay circuits
76562	One spare
74171	House lighting dimmer modules. Dual 20 amp dimmer modules for house light dimmers #1 thru 8
74195	House lighting relay modules. Dual 20 amp dimmer modules for house light dimmers #9 thru 16
74145	House lighting constant current breaker kit 9 space 8 circuit breaker kit for circuits # 17 thru #24
74185	24 circuits of 0-10vDC control output
74141	One spare

2.05 - AUDITORIUM AND STAGE CONTROL MODULES

- A. The control electronics shall be of modular design. The unit must be “slide in” for easy installation and removal. The control electronics module must be field replaceable without disconnecting any control wiring.
- B. Furnish the control modules from one of the following approved manufacturers or an approved equal; see system one line for quantities.
 - 1. Electronic Theatre Controls, Inc.

CAT. #	DESCRIPTION
CEM+	Stage lighting dimmer rack control module. Sensor 96 channel control module.
CEM+	One spare
CMEd	House lighting dimmer rack control module with Unison station processor
DRd-FLO	For 0-10vDC control output 24 circuits for LED house Lighting
CMEd	One spare
UPBO	Battery pack option to keep the processor energized in the event of power loss or interruption to the enclosure. Battery to provide power up to 90 minutes

2. Strand Lighting Inc.

CAT. #	DESCRIPTION
76520-0004	96 way C-21 control processor assembly with architectural power supply and Ethernet switch
76522	96 way, C-21 control processor module (spare).
79100	House lighting dimmer rack control module. Digital Environ (one spare)
xxxxxx	Spare house lighting dimmer rack control processor
63054-2	Vision net DMX interface in enclosure with power supply
DFD DMX24ANL	DMX512 to 0-10v DC analogue converter
xxxxxx	Battery pack option to keep the processor energized in the event of power loss or interruption to the enclosure. Battery to provide power up to 90 minutes
79100	One spare

2.06 - AUDITORIUM AND STAGE MAIN LIGHTING CONSOLE

A. Furnish the quantity of main lighting control consoles and accessories from one of the following approved manufacturers or approved equal:

1. Electronic Theatre Controls, Inc.

QTY.	CAT. #	DESCRIPTION
1	Ion 1500	Ion lighting console in 1536 output configuration, include off

		line editor software
2	-	19" LCD Touch Screen Monitors
1	FADW 2 x 20	Universal fader wing
1	-	20' Network cable (console)
1	-	20' DMX cable
1	Wireless RFU	Remote Focus Unit
1	i-Pad	with lighting software to all I Pad to interface with console
1	-	Ion dust cover.
2	-	19" monitor dust cover
1	-	Fader wing dust cover.
1	2 kVA UPS	Uninterrupted Power Source.
1	-	Controller keyboard
1	-	Controller mouse
2	Littlite	Task lights
1	-	6' extension cable
1	-	6 receptacle power strip

2. Strand Lighting, Inc.

QTY.	CAT. #	DESCRIPTION
1	91816	Light Pallet Classic 1500 with 1500 channels Tracker, Networker, Reporter, CommuniquePro and Offline Editing software
2	-	19" LCD Touch Screen Monitors
1	-	20' Network cable (console)
1	-	20' DMX cable
1	Wireless RFU	Remote Focus Unit
1	i-Pad	with lighting software to all I Pad to interface with console
1	66305	Ethernet Card
1	-	console dust cover
2	-	19" monitor dust cover
1	2 kVA UPS	Uninterrupted Power Source
1	-	Controller keyboard
1	-	Controller mouse
2	Littlite	Task lights
2	-	6' extension cable
2	-	6 receptacle power strip

2.07 - COMPUTER

- A. Furnish a Dell Laptop computer (or equal) which meets all minimum requirements for console off line software package. Include console off line software package installed on the laptop computer.

2.08 - AUDITORIUM AND STAGE CONTROL CONNECTION PLATES

- A. The system will be accessible via interconnection plates for the lighting control console and Ethernet receptacles located at the performance lighting positions. Furnish lighting plugging stations; see contract drawings for type, quantities and locations.

2.09 - AUDITORIUM AND STAGE HOUSE LIGHT CONTROL

A. General Description

1. Control shall be low-voltage type as specified here and as listed below and/or shown on the drawings. Controls shall use low-voltage Class II electrical wiring. All controls shall be able to access and control house light dimmers.
2. Furnish and install the following equipment and accessories; see system one line for quantities and the device location drawing for placement.
 - a) Electronic Theatre Controls, Inc.

CAT. #	DESCRIPTION
U10001-x1F	On/Off Entry stations inside keyed enclosure. Coordinate station color with architect.
U40707	Pendant style Master control station 6 channel plus master fader- Booth
U40707	Pendant style Master control station 6 channel plus master fader- Audio control Booth
U40707-1F	Rack Mount Master control station 6 channel plus master fader- BSCP

1. Electronic Theatre Controls is the basis for design, alternative manufacturers are Strand Lighting or an approved equal.

2.10 - AUDITORIUM AND STAGE NON DIM PANELS

- A. Furnish the enclosure and related equipment from the following approved manufacturers:

1. Lyntec

QTY.	CAT. #	DESCRIPTION
1	LCP 341-20-1U-LA36400 with 40 @ BMB-20 breakers	Non dim lighting panel for LED and Moving Lights circuits ND1-1 thru ND1-40
1	LCP 341-20-1U-LA36400 with 20 @ xxxxxx breakers	Non dim lighting panel for LED and Moving Lights circuits ND2-1 thru ND2-20

2.11 - DMX DISTRIBUTION & ETHERNET WIRING

- A. Furnish equipment as shown on system drawing.

- B. Install a certified CAT 5E network.
 - 1. All branches will be fully tested and documented using a Certified CAT 5E tester.
 - 2. All Components (wire, connectors, inline couplers, patch bay, patch cords, etc.) shall be fully CAT 5E compliant.
- C. Install the following hardware (when quantities above those shown on the system drawing are called for, those extras shall be furnished as loose equipment);
 - 1. DMX/RDM Four port Gateway configured as input node
 - a) ETC N34G-4M
 - b) Provide one for AR-1 and one for AR-2
 - c) ETC is the basis for design, alternative manufacturers are Strand Lighting and Pathport or an approved equal.
 - 2. DMX/RDM Four port Gateway configured as output node
 - a) ETC N34G-4F
 - b) ETC is the basis for design, alternative manufacturers are Strand Lighting and Pathport or an approved equal.
 - 3. HUB-1 36 port minimum managed gigabit network switch with fiber optic interface node and PoE. PoE power to be sufficient to support all devices that are connected.
 - a) 3Com, Cisco, Dell or approved equal.
 - b) Provide one for AR-1
 - 4. HUB-2 24 port minimum managed gigabit network switch with fiber optic interface node and PoE. PoE power to be sufficient to support all devices that are connected.
 - a) 3Com, Cisco, Dell or approved equal.
 - b) Provide one for AR-2
 - 5. PBY-1 Network Patch bay. 36 port RJ45. Provide required number of modular outlets. Include labeling.
 - a) Siemon HD5-series or an approved equal.
 - 6. PBY-2 Network Patch bay. 24 port RJ45. Provide required number of modular outlets. Include labeling.
 - a) Siemon HD5-series or an approved equal.
 - 7. One(1) DMX Opto-Splitter for house lighting fixtures
 - a) Pathway DMX Repeater Pro or equal.
 - 8. Sixty four (64) 3' CAT 5e patch cords. 40 for AR-1. 24 for AR-2
 - a) Black Box EVSA85-000. Alternative manufacturers are Belden or Belkin or an approved equal.
 - 9. PORTABLE NODES
 - a) DMX portable nodes to distribute DMX over Ethernet with any compatible input or output device. Supports ACN, RDM, and USITT DMX 512-A, Compliant with

802.af for Power over Ethernet, Flexible output patch to allow a 512 address universe to begin at any output address. Fabricated from 16 gauge cold rolled steel finished in black, fine texture scratch resistant powder coat, two integrated DMX 5 pin output ports, back lit LCD display for identification. Front and Rear power indicators and RJ45 receptacle for connection to lighting network.

- b) ETC Net 3 two port gateway tour is the basis for design; alternative manufacturers are Strand Lighting and Pathport.

10. Uninterrupted Power Supply - rack mount

- a) APC Smart UPS X3000VA uninterrupt power supply 120v input/120v output, extended runtime model with switched outlet groups to connect critical equipment to a switched outlet group configured to turn on immediately in the event of a power outage and to connect peripheral equipment to a group configured to shut down, after a short period, in the event of a power outage in order to conserve battery run time (or Equal)
- b) APC Smart UPS X 120v external Battery pack (or equal).

11. One wall mount equipment rack for Auxiliary Rack 1 (AR-1). Furnish swing open access wall mount auxiliary rack as indicated on drawing. Furnish rack back box to electrical contractor and coordinate installation. Provide internal power as required. Fill all unused rack spaces with blank panels.

- a) AR-1: Middle Atlantic Products DWR-24-32 with FD-24 front door.
- b) Furnish and install the following equipment in the AR-1 rack see contract drawings for location:

QTY.	DESCRIPTION
1	Panel lights with dimmer.
1	Four port Gateway / input (described above)
1	Four port Gateway / output (described above)
1	DMX Splitter(described above)
1	Network hub w/ fiber optic interface (described above)
1	Network patch bay (described above)
1	Uninterrupted power supply(described above)
1	Uninterrupted power supply battery pack(described above)
1	4u locking drawer

- c) Middle Atlantic is the basis for design; alternative manufacturers are Hoffman, and Rittal or an approved equal.

12. One wall mount equipment rack for Auxiliary Rack 2 (AR-2). Furnish swing open access wall mount auxiliary rack as indicated on drawing. Furnish rack back box to electrical contractor and coordinate installation. Provide internal power as required. Fill all unused rack spaces with blank panels.

- a) AR-2: Middle Atlantic Products DWR-18-22 with FD-18 front door.
- b) Furnish and install the following equipment in the AR-2 rack see contract drawings for location:

QTY.	DESCRIPTION
1	Panel lights with dimmer.
1	Four port Gateway / input (described above)
1	Network hub w/ fiber optic interface (described above)

1	Network patch bay (described above)
1	4u locking drawer
	Brush panels as needed
	Blanks As needed

- c) Middle Atlantic is the basis for design; alternative manufacturers are Hoffman, and Rittal or an approved equal.

2.12 - BACK STAGE CONTROL PANEL

A. General Description:

1. Wall mount equipment rack 6” AFF. Furnish swing open access wall mount rack as indicated on drawing, include locking front door. Furnish rack back box to electrical contractor and coordinate installation. Provide internal power distribution as required. Fill all unused rack spaces with blank panels.
 - a) Middle Atlantic Products DWR-35-17 with FD-35 front door or similar
 - b) Furnish and install the following equipment in the BSCP rack see contract drawings for location:

QTY.	DESCRIPTION
1	Panel lights with dimmer.
2	Digital Clock
1	Auxiliary stage lighting controller(described below)
1	House light Controller(described above)
	7u for sound
	9u for rigging-See stage rigging drawing TH101, DetailA1 coordinate with rigging contractor
1	DMX & Network Plug in Station(described above and as shown on drawings)
1	4u Drawer

- c) Middle Atlantic is the basis for design; alternative manufacturers are Hoffman, and Rittal or an approved equal.

2.13 - AUXILARY STAGE LIGHTING CONTROL

- A. General description; Control shall be low-voltage type as specified here and shown on the drawings. Controls shall use low-voltage Class II electrical wiring. All controls shall be able to access and control house light dimmers.
- B. The fader station is to act as a small event controller that can capture stage lighting presets that consist of conventional and LED lighting fixtures and play them back from the back stage control panel. Operate default or custom system functions including preset selection, manual mode activation, record mode activation, station lockout, raise, lower, sequence control, zone on/off, macro activation and timed event override. Fader functions include master, zone, fade rate, or preset. Custom button and fader functionality programmable via configuration software. Programmable electronic lockout levels. Buttons allow programming of individual lockout levels.
- C. Furnish and install the following equipment and accessories:

QTY.	CAT. #	DESCRIPTION
1	UH61307-1F	1 master, 13 fader, 7 button lighting controller in Back Stage Control Panel (BSCP)

- D. Electronic Theatre Controls is the basis for design, alternative manufacturers are Strand Lighting or an approved equal.

2.14 - AUDITORIUM AND STAGE LIGHTING CONNECTOR STRIPS

- A. This assembly shall be fabricated of 16-gauge, cold-rolled steel with removable covers and shall be in lengths as shown on contract drawings. Terminal strips shall be supplied for feed conduit and wire extending to 36" long pigtails with 2P&G female stage pin connectors for dimming circuits, 18" long pigtails with L5-20 female twist lock connectors for 120V non-dim circuits, 18" long pigtails with L6-20 female twist lock connectors for 208-240V non-dim circuits, which shall be 3-conductor type SO cable. The pigtails shall be securely fastened to housing body by means of strain relief clamps. Strip finish shall be fine-texture, scratch resistant, black powder-coat. One steel hanging bracket shall be supplied for each 5-foot section of connector strip with a minimum of 2 brackets per strip. The terminal blocks shall be a barrier screw clamp type. Strips with 12 or more circuits shall have terminals located in an auxiliary terminal box sized as specified. Outlets and pigtails shall be identified by 2" high black on white numerals. Wire nuts and crimped connectors are not acceptable. The entire connector strip assembly shall be UL listed and labeled. Basis of design is ETC equal by SSRC or Strand or an approved equal.
- B. Furnish the connector strips; see distribution detail drawing for circuit designations and quantities, see device location drawing for locations.

2.15 - AUDITORIUM AND STAGE PLUGGING BOXES

- A. Surface Mount Outlet boxes are fabricated from 16-gauge steel with a fine-texture, scratch-resistant, powder-coat finish. Outlets are 3-pole grounding of 20A grounded flush mount stage pin female connectors for dimming circuits, 20A grounded flush mount L5-20 female connectors for 120V non-dim circuits and 20A grounded flush mount L6-20 female connectors for 208-240V non-dim circuits. Circuits are individually indicated with 3/4" white die cut adhesive labels. Boxes are equipped with grounding lugs. All faceplates to match outlet box enclosure dimensions with no sharp edges exposed. Basis of design is ETC equal by SSRC or Strand or an approved equal.
- B. Pipe Mount Outlet boxes are fabricated from 16-gauge steel with a fine-texture, scratch-resistant, powder-coat finish. Boxes are supplied with wire extending to 36" long pigtails with 2P&G female stage pin connectors for dimming circuits, 36" long pigtails with L5-20 female twist lock connectors for 120V non-dim circuits with L6-20 female twist lock connectors for 208-240V non-dim circuits, which shall be 3-conductor type SO cable. The pigtails shall be securely fastened to housing body by means of strain relief clamps. Pipe mounting hardware is to be configured to overhang boxes. Circuits are individually indicated with 3/4" white die cut adhesive labels. Boxes are equipped with grounding lugs. All faceplates to match outlet box enclosure dimensions with no sharp edges exposed. Basis of design is ETC equal by SSRC or Strand or an approved equal.
- C. Furnish the plugging boxes for dimming circuits; see distribution detail drawing for circuit designations and quantities and see device location drawing for locations.

2.16 - FLOOR POCKETS

- A. Floor pockets are fabricated from 18 gauge steel with a 3/8" cast iron hinged cover with a non-skid tread pattern and cable notches capable of housing a male 19 pin 6 circuit veam connector so that the hinged cover is flush with the finished floor. Circuits shall be labeled with 3/4" labels white on black. Pockets are finished with a fine textured scratch resistant black powder coat. Each floor pocket shall be furnished with a receptacle insert plate and a female 19 pin 6 circuit flush mount veam receptacle and a flush mount RJ45 receptacle for access to the lighting network. The network receptacle shall be separated with a low voltage barrier. See lighting device locations drawing for placement, and distribution detail drawing for circuit designations.

2.17 - CEILING PORTS

- A. Furnish ceiling ports to allow lighting fixtures above the auditorium reflected ceiling panels to light the apron and orchestra pit area. The ceiling ports are to have a minimum opening of 16 inches and a maximum opening of 18 inches to allow the instrument to pan and tilt in order to focus. Color is to be determined by the Architect. See lighting system drawings for placement.

2.18 - AUDITORIUM AND STAGE GRID IRON JUNCTION BOXES

- A. This assembly shall be fabricated of 16-gauge, cold-rolled steel with removable covers. Standard box size shall be minimum 14"W x 14"H x 4"D with four mounting holes. Terminal Strips shall be a barrier screw clamp type. Two terminals shall be provided for each circuit. Terminals shall be sized for the circuit amperage as required. Finish shall be fine-texture, scratch resistant, black powder-coat. Provide ground bussing as required for back box.
- B. See lighting device location and system one line drawing for placement and quantities, and distribution detail drawing for circuit designations.

2.19 - AUDITORIUM AND STAGE BACK BOXES

- A. The following back boxes are furnished by the lighting contractor for installation by the electrical contractor:
1. Locking enclosure for entry stations.

2.20 - AUDITORIUM AND STAGE THEATRICAL LIGHTING FIXTURES

- A. All theatrical lighting fixtures are to include a C-clamp, a color frame, a safety cable w/spring clip, 36" 3-wire leads and 20A grounded stage pin male connector installed except where noted differently.
- B. All LED lighting fixtures are to include a c-clamp, a safety cable with spring clip, 36" 3-wire leads and 20A grounded L5-20 male twist lock connector installed except where noted differently.
- C. All moving light fixtures are to include hanging hardware, 2 safety cables with spring clips and power in cables with L6-20 male twist lock connectors except where noted differently.
- D. Furnish and install the following theatrical lighting fixtures in the auditorium from the following manufacturers or an approved equal: see light plot for quantities.

QTY.	CAT.#	DESCRIPTION
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	Electronic Theatre Controls, Inc. Cat. # 419 OR Strand Lighting, Inc. Cat. # Leko Lite11520	Nineteen degree, 750 watt 115 volt ellipsoidal reflector spotlights.
	Electronic Theatre Controls, Inc. Cat. # 426 OR Strand Lighting, Inc. Cat. # Leko Lite 11530	Twenty-six degree, 750 watt 115 volt ellipsoidal reflector spotlights.
	Electronic Theatre Controls, Inc. Cat. # 436 OR Strand Lighting, Inc. Cat. # Leko Lite 11540	Thirty-six degree, 750 watt 115 volt ellipsoidal reflector spotlights.
	Electronic Theatre Controls, Inc. Cat. # PAR-EA OR Altman Lighting Star Par	Source Four Par ,750 watt w/ lenses set
	Electronic Theatre Controls, Inc. Cat. # 41530 OR Strand Lighting, Inc. Cat. # 11430	Fifteen to Thirty degree zoom, 750 watt 115 volt ellipsoidal reflector spotlights.
	Strand Lighting Inc. Cat# PL CYC LED Is the basis of design alternative manufacturer is Altman Lighting	LED cyclorama wash light with 10' feed thru power and data cables. Power input cable is power con to male L5-20 twist lock connector.
	Electronic Theatre Controls, Inc. Cat.#S4LEDLS	LED leko lighting fixture with 36deg lens tube, x7color system, with 10' feed thru power and data cables.5' Power input cable is power con to male L5-20 twist lock connector
	Electronic Theatre Controls, Inc. Cat. # SELD 60VI	D60 Vivid LED wash light with 7 color system array with 35 deg and 45deg round lens kits with 10' feed thru power and data cables.5' Power input cable is power con to male L5-20 twist lock connector
	Robert Juliat- Lucy Follow spot OR Lycian #M2 Model 2020-12	Short Throw 110v 1200w HMI follow spot, 13-24 deg. zoom, Include base and handrail mounting option, color changer
	Lighting & Electronics Cat# WKLT-C	575 w work light with 20A 2p&G connectors
	Martin Lighting Mac III Performance Profile	Power 208-240 VAC, 1500 short arch discharge lamp, Neutrik PowerCon power in with L6-20 male twist lock connector, CYM color mixing, 7position color

		wheel, 5 indexing rotating gobos, interchangeable animation wheel, 1:5 zoom with focus tracking, pan/tilt-540/268
	Martin Lighting MAC 700 profile	Power100-120/ 208-240VAC, integral power in cable with male L6-20 connector, 700w short arch discharge lamp, CYM color mixing, 8 position color wheel, 9 static gobos, 6 indexing rotating gobos, motorized zoom /focus, interchangeable 3 facet rotating prism, pan/tilt-540/246
	Martin Lighting MAC 700 wash	Power100-120/ 208-240VAC, integral power in cable with male L6-20 connector, 700w short arch discharge lamp, CYM color mixing, 8 position color wheel, beam shaper 0-360 deg. indexable continuous rotation, 12.5-66 deg. zoom pan/tilt-540/246

2.21 - AUDITORIUM AND STAGE THEATRICAL STAGE LAMPS

- A. Approved manufacturers for stage lamps are General Electric, Sylvania, Osram or Ushio or an approved equal.
- B. Furnish and install the following stage lamps for the auditorium stage lighting fixtures in the necessary quantities plus 20% for spares:
 - 1. HPL750/115X, for ETC ellipsoidals and Pars, or NPA Hi-Bright Fast Fit 575w 115v lamps for Strand Leko Light.
 - 2. HLP 750/115v for Altman Star Pars.
 - 3. 1200 watt HMI-DXS lamp for Robert Juliat- Lucy. 1200w HMI lamp for Lycian M2 2020-12
 - 4. FLK (HX600 for L&E Work light-C.
 - 5. Osram HTI 700/D4/75 lamp for Mac 700 profile and Mac 700 Wash
 - 6. Osram HTI 1500W/60/P50 for Mac III Performance Profile..
 - 7. Turn over ALL spares Lamps to the Owner.

2.22 - AUDITORIUM AND STAGE THEATRICAL STAGE LIGHTING ACCESSORIES

- A. Furnish the following stage lighting accessories for the auditorium.
- B. Where amounts are not shown furnish accessories in quantities necessary to meet the needs of the venue:

- C. Lex stage cable is the basis of design or an approved equal.
1. Provide all type S 2 P&G jumpers required to cable light plot and furnish the following jumpers.
 - (a) 40 @ 5'-0", 12 AWG, type S extension cables w/male and female 2P&G connectors installed.
 - (b) 30 @ 10'-0", 12 AWG, type S extension cables w/male and female 2P&G connectors installed.
 - (c) 20 @ 25'-0", 12 AWG, type S extension cables w/male and female 2P&G connectors installed.
 - (d) 15 @ 50'-0", 12 AWG, type S extension cables w/male and female 2P&G connectors installed.
 - (e) 20 @ 10'-0" 12 AWG, type S extension cables w/male and female L5-20 connectors installed.
 - (f) 15 @ 10'-0" 12 AWG, type S extension cables w/male and female L6-20 connectors installed.
 2. Provide all 2-fers shown on light plot and furnish the following 2-fers.
 - a) 20 @ 2-Fers, w/male and female 2P&G connectors installed for interconnection of fixtures
 - b) 20 @ 2-Fers, w/male and female L5-20 connectors installed for interconnection of fixtures
 3. 25 @ 15' male DMX 5 pin to female DMX 5 pin cables.
 4. Ten (10) Drop in Iris units for ellipsoidal stage lighting fixtures.
 5. Eighteen (18) barn doors for the over stage par lamps.
 6. Sixteen (16) donuts for use in the ellipsoidal reflector stage lights.
 7. Twenty (20) additional safety cables.
 8. Rosco, Lee, Gam and Apollo are acceptable manufacturers of gel or an approved equal. In additional to all gel shown on light plot furnish one hundred (100) additional sheets assorted color media as follows:
 - a) 6 sheets Roscolux 33
 - b) 6 sheets Lee 202
 - c) 8 sheets Roscolux 119
 - d) 4 sheets Roscolux 54
 - e) 8 sheets Lee 152
 - f) 1 sheet Lee 203
 - g) 8 sheets Roscolux 68
 - h) 4 sheets Roscolux 55
 - i) 4 sheets Roscolux 52
 - j) 4 sheets Roscolux 364
 - k) 2 sheets Roscolux 114
 - l) 10 sheets Roscolux 81
 - m) 10 sheets GAM 685
 - n) 10 sheets GAM 235
 - o) 5 sheets Roscolux 321
 - p) 5 sheets Roscolux 385
 - q) 5 sheets Roscolux 39
 9. Twenty(20) A size Pattern Holders for ellipsoidal spotlights.
 10. Ten(10) B size Pattern Holders for ellipsoidal spotlights.
 11. Patterns as follows:
 - a) 8 GAM #222
 - b) 8 GAM #294
 - c) 2 GAM #201
 - d) 2 GAM #204

12. Dance Booms.

- a) Each boom consists of two sections of 30" x 30" x 84" side light truss (14'-0" tall) designed so that truss members do not interfere with lighting fixtures. Truss sections to include castered bottoms with a round tube mounting option for use with c-clamps. The top truss section is to include a tie off ring at the top of the truss. Tomcat Dance Tower Truss is the basis of design. See contract drawings for quantities, locations and details

2.23 - ADD ALTERNATE #2

- A. Provide 6 additional intelligent light fixtures as follows.

	Vari-Lite VL 2500 Spot	Power100-120/ 208-240VAC, power in cable with male L6-20 connector, 700w short arch discharge lamp, CYM color mixing, High performance dual blade strobe system, Rotating gobo wheel with 5 rotatable indexing gobo positions, Fixed eleven gobo wheel with one open position capable of continuous rotation, 18.5-42 deg. zoom pan/tilt-540/270
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2.24 - ADD ALTERNATE #3

- A. The entire LED CYY ground row package.

PART 3 - EXECUTION

3.01 - STANDARDS COMPLIANCE

- A. Comply with all local building codes.
- B. In the absence of specific local codes, comply with the National Electrical Code (NFPA-70) as applicable to installation and construction of stage lighting and control equipment.
- C. Where not in conflict with local building codes or the National Electrical Code comply with industry standard professional practices.
- D. Installation practices shall be in accordance with OSHA Safety and Health Standards.

3.02 - SHOP DRAWINGS

- A. Submit within thirty (30) days of the bid acceptance, for review and approval by the Owner, Architect, and Consultant:
 - 1. Complete shop drawings and data sheets for all items specified.
 - 2. Complete shop drawings for all components, assemblies, sub-assemblies, cabinets, wiring devices and hardware required to implement the work.
 - 3. Riser diagrams showing all quantities, types and sizes of inter-connection wires to be installed by others.

4. Schematics of all block assemblies and sub-assemblies, including pin out identification of all low voltage cable connectors.
5. Approval of shop drawings does not relieve the Contractor of the responsibility of providing equipment in accordance with these specifications. Any deviations from the specifications shall be "starred" and noted in 1/4" high letters. Only deviations, which upgrade the quality of the equipment, shall be considered.
6. In addition to drawings, the Contractor may elect to submit catalog cuts for certain standard equipment items. These shall contain full information on dimensions, construction, applications, etc. to permit proper evaluation. In addition, they shall be properly identified as to their intended use and any options or variations shall be clearly noted.
7. Samples may be requested by the Architect and shall be furnished for inspection at the Architect's office, at the Contractor's sole expense.
8. Prior to the commencement of fabrication and delivery, the Contractor shall submit for approval, to the Architect, an outline of a proposed commencement and completion schedule of project requirements.

3.03 - PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver stage lighting equipment and controls to job site securely wrapped in containers.
- B. Coordinate delivery dates with the Division 26 contractor
- C. All equipment shall be stored in a clean, dry space.
- D. Discrepancies in quantities or missing equipment shall be noted, in writing, and brought to the attention of the manufacturer within five days of receipt.
- E. Replacement of missing or damaged equipment shall be the responsibility of the Contractor.
- F. Handle equipment and controls carefully to prevent breakage, denting and scoring finish.
- G. Replace and return damaged units to equipment manufacturer immediately.
- H. Store in original cartons and protect from dirt, physical damage, weather, and construction traffic.

3.04 - INSTALLATION

- A. The Contractor shall furnish, deliver, install and terminate all system control wires.
 1. All cables shall be permanently labeled at every termination. The label shall not be hand written. Clear heat shrink shall cover the label.
 2. Service loops of not less than 6" will be present at all terminations to equipment.
 3. All pulls to be made be hand, care will be taken not to nick cable jackets, and any nicked or damaged cable will be replaced.
 4. A pull string will be left in all conduits after wire is installed.
 5. NO SPLICES WHATSOEVER IN CONDUIT!
 6. Include spare cables with all field runs. Quantity to be 10% or 1 whichever is greater unless otherwise specified.
 7. Where shielded cable is in use leave shield drain wire the same length as the circuit conductor(s), sleeve shield drain wire in green pvc tubing. Cap where the cable jacket was removed with heat shrink. Where the shield drain wire is to be lifted follow the

above and fold back over cable jacket. Then cap end with heat shrink. Do not use a single piece of heat shrink for this use two smaller ones.

8. All soldering will be clean and neat and not exhibit evidence of a " cold" joint, where necessary heat sinks will be used. Use only rosin core "electronic type" solder.
 9. Wire nuts will be not allowed.
- B. The Contractor shall furnish and install all system control devices.
 - C. The Contractor shall hang and aim the stage fixture hanging plot.
 1. Provide the Theatre Consultant fourteen (14) days notice prior to this work being scheduled.
 2. The Theatre Consultant shall verify the aiming of the stage fixtures.
 - D. The installation of all work shall be neat.
 - E. All boxes, equipment, etc shall be plumb and square.
 - F. The installation shall conform to the plans and spec.
 - G. The contractor shall not commence the installation of equipment and devices, other than the pulling of cable, until all areas are clean, painted and finished to a point that they are completely dust, dirt, lint, fiber and airborne particle free. The air conditioning system must be operating to its design level and be able to keep all areas with control equipment stable.

3.05 - INSTALLATION COORDINATION

- A. The Contractor shall specifically coordinate the placement and sizes of conduit relating to this work and shall specifically review and approve the conduit rough-in in time to advise all parties of needed changes, omissions, etc.
- B. The Contractor shall report this successful coordination in writing to the Architect.
- C. If any conflicts or omissions occur as a result of the Contractor's unsuccessful coordination of the above mentioned work, it shall be the Contractor's responsibility to correct, furnish and install any additional material that may be required.
- D. The contractor shall at all times coordinate his work with the other trades to ensure smooth progress of work and satisfactory final results.
- E. The Contractor shall examine areas and conditions under which stage lighting and controls are to be installed and notify the Architect in writing of conditions detrimental to proper installation and operation.

3.06 - INSPECTION AND TESTING:

- A. During the installation of the equipment the contractor shall arrange for access as necessary for inspection of equipment by the owner's and/or architect's representatives.
- B. Provide a safe means of accessing all system components for all visits.
- C. Equipment Pretesting: All racks are to be built and wired in contractors shop and tested prior to delivery to site. All other equipment is to be tested prior to delivery and installation. A written test report will be submitted to the owner.
- D. Final Inspection:

1. The final inspection will confirm that the systems, as installed, meet the requirements of this spec, the contract documents, and the approved contractor's shop drawing and submittals.
2. The contractor will inform the owner in writing of the system's completion. The contractor will then request final inspection by the consultant, and carry out the necessary coordination. This coordination includes:
 - a) Giving at least fourteen days notice to the consultant prior to the final inspection.
 - b) Arranging for the contractor's and consultants exclusive use of the space.
 - c) Arranging for a HVAC technician to be available to turn the AC system on and off as required.
 - d) Arranging for a sound technician to be available to control the sound system as required.
 - e) The contractor's job foreman and one additional worker familiar with the job will be present during all check out, testing and inspection.
3. Contractor will complete the following tasks prior to consultant's arrival:
 - a) Unpack and assemble all portable equipment.
 - b) Place all portable equipment in one location.
 - c) If anything has been turned over to the owner have the signed Letters of Transmittal on site.
 - d) Complete all required paperwork (pre-testing reports, letters indicating successful coordination of the installation, etc.).
 - e) Remove all security covers.
 - f) Contractor will provide all necessary software, cables, and interfaces to facilitate the setting of computer controlled, remote controlled or digitally controlled equipment.
4. Contractor will provide the following test equipment for use during inspection and acceptance testing:
 - a) Some type of light meter
 - b) Some type of DMX checking device
 - c) Some type of Multi-meter.
 - d) Contractor will provide safe means to access all system components during the entire commissioning process.
 - e) Contractor shall provide personal and equipment to make any adjustments to the theatrical lighting system(s), as well as to correct problems, for the entire inspection and testing period.
- E. The Theatre Consultant or his representative will conduct all final system tests in order to determine final acceptance.
- F. In no event shall the theatrical lighting systems installation be submitted for final approval or acceptance until any and all elements of the facility that may have a bearing on the system performance, including but not limited to doors, windows, HVAC, carpeting, furniture, wall coverings, stage flooring, rigging systems, interior design elements, architectural lighting and lighting control systems have been completed and are operable. All elements that may affect stage lighting systems operation or performance shall be "on" and operating during

adjustments. The stage lighting contractor will be responsible for coordinating the requirements of this paragraph with other work on the project.

- G. Equipment Backorders. Should any component or equipment be on backorder at time of system inspection and testing, the contractor shall provide comparable loaner equipment, with loaner equipment provided at contractor's expense. Said equipment shall remain on-site until backordered equipment is delivered and installed.

3.07 - MANUFACTURER'S SERVICES

- A. The Contractor shall provide for:
1. A manufacturer's field service engineer to perform initial system activation. Under no circumstances shall power be applied to any equipment prior to initial system activation.
 2. The manufacturer's field service engineer shall inspect and confirm that all low voltage terminations are correct.
 3. Such engineering services shall be furnished within twenty-one (21) days of a written request by The Contractor.

3.08 - TRAINING AND INSTRUCTION

- A. The Contractor shall furnish sixteen (16) hours of on site instruction to Owner designated persons. This instruction shall happen on four occasions. The general conditions require all training sessions to be videotaped. This contractor is to coordinate with this requirement and if required perform the taping.
1. The first occasion shall take place at the time of initial system activation and be performed by the manufacturer's field service engineer. The duration of this occasion shall be not less than three (3) hours. This instruction shall cover all aspects of operation and maintenance required by this system.
 2. All other occasions shall be coordinated with the owner representative and Contractor with (21) days written notice. This instruction shall be an overall review of the system operation and detailed console operations. The final occasion shall take place within the first six months following system activation.
- B. Provide operational assistance for the first usage of the system. This is to be on the owner's time schedule but, not to exceed 8 hours.

3.09 - MANUALS

- A. Prepare four identical copies of owner's manuals. The owner is to receive two, the consultant receives one and the contractor retains one. Additionally, inside the primary dimmer or auxiliary control rack, provide a document pouch and one set of final as-built drawings. Before distribution of manuals submit one copy to consultant for approval. Each manual is to contain the following:
1. System one line drawing including all labeling and changes ("as built").
 2. Owner's manual for each piece of equipment.
 3. Schematic diagram for each piece of equipment.
 4. Contractor's service phone number in a conspicuous place.
 5. All test reports.

3.10 - WARRANTIES

- A. Contractor will warrant the system to be free from defects in materials and workmanship for a period of one year from the date of acceptance, or first beneficial use, which ever comes first. Acts of god and owner abuse or neglect are not covered.
- B. During the warranty period the contractor will respond to and correct any call for service within one day of the call.
- C. Loaner equipment will be provided if necessary.
- D. The manufacturer of the stage lighting and control equipment shall warranty the electrical distribution, dimming and control equipment to be free from defects of material or workmanship for a period of two years from the date of acceptance.
- E. The manufacturer shall warranty all fixtures and accessories (except lamps) to be free from defects of material or workmanship for a period of one year from the date of acceptance. During the period of this warranty, equipment that proves to be defective shall be repaired or replaced at no charge (excluding freight). Unauthorized local repairs of equipment during the warranty period shall relieve the manufacturer of his responsibilities under this warranty.
- F. Include the name, address, and phone number of at least two- (2) factory authorized Field Warranty centers within a 250-mile radius of the job site in the operation and maintenance manual.

3.11 - FINAL ACCEPTANCE

- A. The following conditions must be met before final acceptance will be granted:
- B. Inventory of all equipment by the project Architects or his representative.
- C. All inventoried portable equipment is in secure storage, accessible only by the Owner.
- D. Approval of final tests and inspections by the project Architects, Theatre Consultant, and Owner.
- E. Submittal to the Architect of three (3) signed copies of the warranty(ies).
- F. Satisfactory completion of all punch list items.
- G. At the date of system activation, the Contractor shall furnish and replace all lamps in stage lighting fixtures, which are observed to be noticeably dimmed, as judged by the Architect or his representative.

END OF SECTION 26 55 31

SECTION 274118

SOUND & VIDEO SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Special Conditions and Division-1 Specification sections, apply to work specified in this section.

1.02 RELATED WORK AND REQUIREMENTS

- A. Basic Electrical Requirements
- B. Raceways and Conduits
- C. Wires and Cables
- D. Outlet Boxes
- E. Grounding

1.03 SCOPE OF WORK

- A. This section requires the fabrication, furnishing, delivery, installation, testing of the sound and video systems and equalization of the sound system as indicated on the drawings and specified herein.
- B. The sound contractor shall provide all materials, equipment, procedures, labor, tools, scaffolds, and incidentals necessary to the scope of work.
- C. It is the intention of these specifications that the sound contractor provides a professional quality, complete and properly operating system in every respect and detail.
- D. The installation contractor shall examine the plans in detail to familiarize him with the scope of the work.
- E. The installation contractor shall assume full responsibility for a complete operating installation, in the required location, in accordance with the contract documents.
- F. The contractor shall provide all necessary specialty equipment for the complete sound and video system installation as specified herein.
- G. The contractor shall provide all necessary specialty equipment for the complete sound and video system as shown on the drawings.

- H. Any errors, omissions, or ambiguities found in these documents do not relieve the Contractor of the responsibility of providing all items necessary for complete, safe, fully functional systems. Any errors, omissions, or ambiguities shall be brought to the attention of the Architect/Engineer of Record, Owner, and/or Theater Consultant for clarification.
- I. The drawings and specification when taken together communicate the design intent of the system. The contractor is responsible for all engineering, procedures, drawings, equipment, material, means and methods, and contract administration necessary to fully and completely provide and install the system contemplated by these documents.
- J. No changes will be allowed for any issue that could have or should have been known at the time of bid. This includes but is not limited to discontinued products.
- K. The contractor is solely responsible for meeting all codes and regulations and for the complete code compliance of the finished system.
- L. The contractor shall employ the most current best standard practices for all aspects of work.
- M. The contractor acknowledges that the consultants' opinion is final.
- N. Coordinate fully with the electrical contractor.

1.04 WORK INCLUDED IN THE AUDITORIUM THEATER

- A. Without restricting volume or generality of above "Scope", work to be performed under this section shall include, but is not limited to, the furnishing and installation of the following:
 - 1. Sound Reinforcement System. A sound reinforcement system consisting of left, right, center clusters, mixing console, microphone and line level inputs, microphones, stands, cables, accessories, and all necessary processing and electronics.
 - 2. Show Monitor System. A system comprising of a show monitor mic mounted in the theatre, which is feed to speakers in the public and backstage areas.
 - 3. Production Intercom. A two channel intercom system for technical communications.
 - 4. An Assisted Listening System. A broadcast system that sends program to receivers with earphones for the hearing impaired.
 - 5. Sound Booth Wire Duct. This contractor is to install "Panduit" type plastic wire ducts in the sound booth. These ducts are to carry all necessary cabling between the under counter junction boxes, the processing rack mounted on the wall, and the mixing console. A separate duct is required for each signal level.
- B. Control system programming in a manner that meets all the owner's needs and request in terms of function and usability.
- C. Supply all non standard back boxes shown on the electrical drawings.
- D. Power distribution within all equipment racks. Provide a jbox in the top of each rack for the electrical contractor to "make up" to. Provide power strips, power outlet boxes, internal rack

wiring and everything necessary to power up all rack equipment. System power is via a sequenced panel board. See electrical drawings for more details.

- E. Provide sound panel board.
- F. Control booth wire duct (Panduit).

1.05 WORK NOT INCLUDED

- A. The following items of work, if required, are included in other sections and must be reviewed by the sound contractor for impact on this work:
 - 1. Necessary conduit and raceway runs.
 - 2. Stage flooring.
 - 3. Theatrical stage lighting and electrical connections, electrical contractor supplied junction and back boxes, wiring to power sources, and wiring to all other electrically powered devices.
 - 4. Front of house catwalks.

1.06 CONTRACTOR'S QUALIFICATIONS

- A. The work of this section will be contracted to a single firm, referred to as the contractor.
- B. The contractor shall be a systems contractor who regularly engages in the furnishing, installation and servicing of professional systems of similar nature, size, scope and complexity to that contemplated by this specification. The contractor shall have done so for a period of not less than five years preceding the bid date.
- C. The contractor shall have maintained for the five years preceding the bid date, a suitably staffed and equipped service organization which has continuously offered maintenance and repair services for systems of the nature, size, scope and complexity to that contemplated by this specification.
- D. The contractor shall demonstrate to the satisfaction of the owner, through exhibits presented with his bid, that the sound contractor has a history to indicate the following:
 - 1. Statement of company history. Include a breakdown by percentage of gross sales of all business activities the contractor is involved in for each of the last 5 years (e.g. system installation = 30%, box sales = 40%, equipment rentals = 20%, design and other professional services = 10%, etc).
 - 2. Previous experience: Provide a list of four installations of the type and size contemplated by these specifications, currently in use as originally installed, in which a theatre / system consultant was involved, completed in the last 5 years and the following information regarding each installations:
 - a. Name and address of each installation facility.
 - b. Facility owner and telephone number.

- c. Name, address, and phone number of a person regularly employed by the owner, who is familiar with the operation of the systems and who has no connection or business connections with the contractor except as the contractor shall fully disclose
 - d. Name, address, and phone number of the theatre / system consultant, along with the names of all the consultant's personal directly involved.
 - e. System shop drawing - These will be returned if the contractor provides a call tag or return postage.
 - f. Owner's manual drawing - These will be returned if the contractor provides a call tag or return postage.
 - g. System as-built drawings drawing - These will be returned if the contractor provides a call tag or return postage.
 - h. List of contractors personal involved with each persons responsibility on the project.
 - i. Name, address and phone number of the general contractor, along with the names of all key GC personal directly involved.
 - j. Name address and phone number of the electrical contractor, along with the names of all key EC personal directly involved.
3. Statement of current company capabilities and ownership.
 4. Key Personnel: For each of the key personnel listed below; Include individual's name, title, and number of continuous years of service to contractor. Include a biography detailing industry experience, and role within organization (include only full-time/regular staff employees; not independent contractor, freelance, or temporary positions). List all industry certifications held, training courses attended, and continuing education credits, including dates of attendance. List recently completed projects, scope of project, and completion dates.
 - a. Project Manager
 - b. Senior Technician
 - c. Service Manager
 5. Other Department Staff – Include size of staff, and experience of each staff member.
 6. Replacement and Spare Parts Inventory – Provide detailed list of primary replacement parts, components, and spares typically held in inventory.
 7. Test Equipment and Physical Plant – Include an inventory of all test facility equipment owned and used regularly by the Service Department. Provide description of physical plant and space utilization.
 8. Copies of all business and professional licenses and insurance certificates.

PART 2 - PRODUCTS

2.01 ALTERNATES

- A. In no case will equipment or materials of lesser design or workmanship be acceptable. Only those materials and equipment listed in this specification will be considered unless prior approval is sought and received.
- B. Substitutions: When a specific piece of equipment specified has been discontinued and/or replaced by a new model, substitution will be acceptable when:
 - 1. Submission of complete data on the new model or substitute has been approved by the owner prior to equipment acquisition. Data shall include list pricing for specified and replacement equipment.
 - 2. Substitute equipment or the replacement of rejected equipment shall be at the sole expense of the sound contractor.
 - 3. After submittals have been approved there will be no cost to the owner for any required replacement equipment under any circumstances.
- C. Should the contractor proposed and receive approval for the use of alternative wire and cable which requires additional conduit, the contractor will be solely responsible for the installation of such conduit.

2.02 GENERAL REQUIREMENTS

- A. The major items of equipment shall be furnished in the quantity as on the drawings and the quantity as specified herein.
- B. When documents list several acceptable manufacturers for a particular item of equipment, more than one of which is to be provided, the sound contractor shall supply all of those similar items of equipment from one manufacturer.
- C. The sound contractor will provide necessary millwork, enclosures, baffles, grille cloth, wall plates, and any other item furnished under this contract not specifically noted otherwise herein or on the drawings in a manner and color as approved by the owner.
- D. Any item of equipment or hardware that may not be specifically shown on the drawings or specified herein but required for proper sound system operation or installation shall be furnished and installed and be of the highest quality available.
- E. The performance of all equipment must meet the most recently published manufacture's data sheet
- F. Provide all power supplies required.
- G. Provide all software.
- H. Provide the follow equipment in the quantities shown on the contract drawings:
 - 1. MIX-1: 72 mono, 8 stereo input digital front of house mixing console, 8 local mic/line ins and 8 local line outs.
Yamaha CL-5 mixer. Include main & spare PW800 power supply, power supply cable and LED Littlite Lamp sets. Include console dust cover, Dugan-MY-16

- card MY8-AE96S card and MY8-ADDA96 card. Include road case with wheels and "TMB EZ-tilt" console stand.
2. RIO-1: 32 input, 16 output, 4 AES digital out Dante audio network interface. All inputs and outputs shall be balanced
Yamaha RIO3224-D
 3. CDR-1: Compact disk recorder / player. All inputs and outputs shall be balanced. Include a wired remote.
Tascam CD-RW901SL
 4. IPD-1: Ipod dock with controls.
Tascam CD-200iB
 5. WIR-1: UHF Digital Wireless mic system. Twenty four (24) transceiver systems are required. Provided 12 handheld and 24 bodypack transmitters. All receivers shall be Shure ULX4Q series. Provide standard accessories (i.e. microphone clips, lavalier accessories, zippered cases, starter battery, ½ wave antennas, power supplies, receiver rack mount kits, etc). Coordinate frequency band with local TV Broadcast stations and other RF transmission systems in use. Provide Shure Wireless Workbench control software.
 - 6 @ Shure ULX4Q - quad channel digital receivers.
 - 12 @ ULXD24/Beta87A – handheld transmitter with Beta 87A mic, WA371 mic clip and #26A14 zipper bag
 - 24 @ ULXD1 – bodypack transmitter with 26A13 zipper bag
 - 48 @ SB900 batteries
 - 3 @ SBC800-US battery charger + power strip & 6' extension cord
 - 24 @ B6 –Countryman subminiature omni lavalier mic with TA4F connector
 6. WIR-2: Wireless antenna distribution amp. Provide active antennas.
Shure UA845SWB.
 7. WIR-3: Active Wideband Antennas. PROVIDE AS REQUIRED – NOT SHOWN ON ONE LINE DRAWING. Include (1) pair active antennas. Provide rigid mounts for the antennas, permanently installed in the correct orientation.
Shure UA874 or as required
 8. WCM-1: Wireless Intercom System with 4 single channel beltpaks. Include (1) pair antennas, rechargeable battery packs and 4 port battery station. Provide rigid mounts for the antennas, permanently installed in the correct orientation.
 - HME Pro 850 Base Station
 - 4 @ HME BP850 beltpacks
 - 6 @ HME BAT850 rechargeable battery packs
 - 1 @ HME AC850A charger base station
 9. PRO-1: Programmable digital signal processor. 6 input x 16 output. Provide Meyer Compass control software with RMS built in.
Meyer Galileo 616
NOTE: THE FIRE ALARM INTERFACE SHALL BE CONFIGURED IN SUCH A WAY THAT WHEN IN ALARM MODE THE SYSTEM VOLUME SHALL MUTE.
 10. PRO-2: Programmable digital signal processor. 8 input x 8 output
Symetrix SymNet Audio Matrix 8x8 DSP
NOTE: THE FIRE ALARM INTERFACE SHALL BE CONFIGURED IN SUCH A WAY THAT WHEN IN ALARM MODE THE SYSTEM VOLUME SHALL MUTE.

11. ALS-1: Assistive listening system. Channel E.
Listen Technologies Corporation (or equal by Williams Sound)
1 model LT-800 transmitter.
40 model LR-300 receiver
32 model LA-161 earbuds.
8 inductive loops
1 model LA-326 rack mounting kit.
1 model LA-116 remote coax antenna.
1 model LA-313 carrying/storage case
1 model LA-304 wall plaque kit
2 complete sets of batteries
Battery chargers, power strips, etc. to accommodate one complete set of batteries
12. AMP-1: 520 watt per channel stereo into 8 ohms.
Crown MA 2402
Crest PRO 7200
QSC PL 325
13. AMP-2: Show Relay Mixer Amplifier
TOA model A-912 MK2 with rack ears, one L-11S balanced line input module
and one M-11S microphone input module.
14. MPS-1: 48 volt speaker system power supply and controller with RMS module.
Meyer MPS-488HP power supply.
15. RMS-1: RMS Server interface for connecting sound network to the Meyer RMS remote
monitoring system. Include Compass software.
RMServer
16. NET-1: 16 port 10/100/1000 Gigabit Ethernet switch for sound network running Meyer
Galileo/RMS remote monitoring software.
Cisco SG100-16
17. NET-2: 24 port 10/100/1000 Gigabit Ethernet switch with QOS for Dante audio network
and Shure wireless monitoring software.
BSS GS724T
18. COMP-1:
Dell XPS 15, i7-332Qm processor, Windows 7, 64 bit, 16GB ram, 512GB SSD,
Blu-ray, NVIDA GT640< with 2GB video, all required software
19. Provide speaker rigging hardware + power + signal cabling for every speaker.
20. SPK-1: Main full range self powered speaker, center cluster , 40X35 coverage, with
RMS module.
Meyer MSL-4
21. SPK-2: Main full range self powered speaker, stereo cluster bottom cabinet, 80X40 wide
coverage, with RMS module.
Meyer CQ-1
22. SPK-3: Main full range self powered speaker, stereo cluster top cabinet, 50X40 narrow
coverage, with RMS module.
Meyer CQ-2
23. SPK-4: Main full range self powered down fill speaker, 50 symmetrical coverage, with
RMS module.
Meyer DF-4
24. SPK-5: Main full range delay fill speaker, 100X40 coverage, with RMS module.
Meyer UPA-1

25. SPK-6: Main cluster self powered sub woofer, with RMS module.
Meyer 700-HP
26. SPK-7: Main full range 48 volt powered front fill speaker, 80X50 coverage. Portable, provide floor bracket with each speaker
Meyer UPM-1XP
27. SPK-8: Ceiling Speakers: Backbox / speaker / baffle assembly for distributed systems. Coordinate the color of the baffle with the architect.
Atlas Soundolier 96-8(-x) Backbox w/ 180 Series Channel Support. Atlas Soundolier 61-8W Baffle. Atlas Soundolier C10LAT70 Speaker and transformer
28. ICM-1: Intercom power supply
Clear Com PS 704
29. ICSS: Intercom speaker station
Clear Com KB-701 or KB-702
See contract drawings for type required. Provide a backbox for each station
30. Projection Screen:
Draper Truss-Style Cinefold Portable Projection Screen
16:9 HDTV format 245" diagonal
Provide CineFlex CH1200V rear projection surface (install this surface)
Provide Matt White XT1000V front projection surface
Include 2' bottom dress drape
Hang from stage rigging system batten
31. DWR-3: 3U rack drawer.
Middle Atlantic Products D3
32. DWR-2: 2U rack drawer.
Middle Atlantic Products D2
33. ATN-1: 10 watt attenuator
Atlas Soundolier AT10
34. ATN-2: 35 watt attenuator
Atlas Soundolier AT35
35. LGT-4: Rack mount light module with power distribution outlets
Furman Sound PL-8 Series II
36. LGT-3: Rack mount light module
Littlite RL-10-D
37. SWT-1: SPST MON push button switch
Augat MPG-106F
38. LGT-2: Local control light, 12 VDC, panel mount
Dialight 557-1503-203 (or as required by the system processor's logic outputs)
39. POT-1: 10Kohm linear control pot. and knob.
Clarostat RV4NAYSD103A + Atlas Soundolier HX21-B
40. SWT-2: Power system on and off push button switches – shown as “ON” and “OFF” on the drawings
Lyntec SS-2 Sequencer switch set
41. RACK RS-1: Floor Mounted 19" slide out rack. Provide locking doors, top and side panels as required.
Middle Atlantic Products model WR- 44-32
42. RACK RS-2: Dual Credenza style 19" equipment rack. 12U pull out rack rail system. Coordinate with architect on finishing kit for style and color choices of sides, top, rear panels. Smoked plexi doors to match.

Middle Atlantic Products C5F2-D

43. RACK RS-3: Single Credenza style 19" equipment rack. 12U pull out rack rail system. Coordinate with architect on finishing kit for style and color choices of sides, top, rear panels. Smoked plexi doors to match.

Middle Atlantic Products C5F1-D

44. RACK RS-4: Portable 19" Equipment Rack. 12U Custom "Anvil" style, single wide, rolling equipment rack. Removable front and rear covers. Minimum 2" foam, with floating internal racks. Minimum 4" full swivel casters, of which two shall lock..

R&R Cases

45. RACK RS-5: Portable 19" Equipment Rack. 8U Custom "Anvil" style, single wide, equipment rack. Removable front and rear covers. Minimum 2" foam, with floating internal racks.

R&R Cases

46. RACK RV-1: Video rack.

Middle Atlantic Products MRK-4026AXS

Provide tracks and tracks stand for each rack

Provide side and top panels as required

47. COS & POS: Hofmann enclosure. See panel drawing for details

48. CO: Custom FSR WB-610 or WB-1X or WB-2X as required. Size, type and plates as required. Provide all necessary part including doors and covers.

49. TVs:

All TVs must have IR control

Include IR "bugs"

50" TV cannot be taller than 27"

All TVs shall be 1080p native

50. Cable Ladders – PROVIDE AS REQUIRED – NOT SHOWN ON ONE LINE DRAWING

1 Lot CL Series by Middle Atlantic Products. As needed, to span overhead from stub-outs in the amp/dimmer room, and feed down to the equipment rack. All cable ladders shall be located 80" A.F.F., or as required by code, and allow clear access to equipment racks. Include all necessary ladder sections, suspension hardware, and accessories.

- I. Panels: All panels are made of 1/8" thick Aluminum plate, brushed anodized black and sealed. All controls and connectors will have engraved labels. The minimum allowable label size is 1/8"s. All labels will be back filled with white paint. All connectors are mounted with machine hardware. All panel layouts and labels must be submitted and approved prior to construction, the panels shown in the drawings are typical only.
- J. Microphone Receptacles: The above general requirements for panels apply to the construction of Microphone Receptacles as well. See the contract drawings for quantity and type required.
- K. Monitor Speaker Receptacles: The above general requirements for panels apply to the construction of Monitor Speaker Receptacles as well. See the contract drawings for quantity and type required.
- L. Tie Line Receptacles: The above general requirements for panels apply to the construction of Tie Line Receptacles as well. See the contract drawings for quantity and type required.

M. Intercom Connection Receptacles: The above general requirements for panels apply to the construction of Intercom Connection Receptacles as well. See contract drawings for quantities and types required. All 6 pin connectors must be Switchcraft compatible.

N. Custom panels: See drawings for required components.

O. System Wire: All wiring installed in a conduit which is located in the slab must be rated for wet locations.

1. 10 A.W.G. for speaker lines enclosed in conduit, racks, or speaker enclosures. Use for all speaker runs except 70 volt systems. 10 A.W.G. THWN.
2. 16 A.W.G. twisted pair for RMS control system and for 70 volt audio wire for use in conduit, racks, or speaker enclosures. West Penn Wire AQC 225
3. 22 A.W.G. shield twisted pair for all mic, line or D.C. control lines enclosed in conduit or racks. Belden 5500F1 or West Penn Wire AQC 291
4. 18 A.W.G. Shielded twisted pair with 18 A.W.G. drain wire for all intercom lines enclosed in conduit or racks. Belden 5300F1 or West Penn Wire AQC 293. An additional 12 A.W.G. THWN will be required if speaker stations are used. This additional wire shall be used in parallel with the drain wire of the shielded twisted pair cable.
5. 24 A.W.G. shield twisted pair for all AES/EBU digital audio lines enclosed in conduit or racks. West Penn DA2401.
6. Coax Antenna Lines. As called for by equipment manufacture.
7. UTP Category 5 network cable. Four twisted pair of 24 A.W.G. wire with an outer diameter suitable for termination by standard type RJ-45 connectors. Use for all Category 5 cable run within a conduit or raceway. Belden 7934A.
8. Category 5 service cable. Use for all Category 5 cable NOT run within a conduit or raceway. TMB Associates ProPlex™ Ethernet cable.
9. RG6 coax for all video cable (including HD-SDI) West Penn Wire AQC806
10. RG 11 coax for wireless receiver antennas Liberty RG11-DB-CCTV
11. RG59 coax as required West Penn Wire AQC 815
12. DC power + signal for all under balcony and front fill speakers. Each location is home run back to the equipment rack. West Penn Wire AQC 225 + West Penn Wire AQC 291 or Belden 5500F1
13. Crestron cable as called for by manufacture. Wet location rated as necessary by installation location.
14. Extron cables as called for by Extron -

P. Sound Panel Board: Provide the following sound power panel board to the electrical contractor:

1. LynTec Model RPC341 sequencing panel board
Standard 225 amp main breaker
See drawings for breaker type and configuration
SGX20-10 power conditioning side car

Q. Portable Equipment: Provide the following portable equipment that is not shown on the contract drawings:

1. Show monitor mic: Mount a Shure SM87 from the near catwalk pointed toward the stage and wired to the near catwalk mic jack. This is a permanent installation and will require a custom assembly of mic mounting hardware. Typically a mounting flange with a small boom arm will be required to place the mic out into the room and rigidly hold it in position. Fishing line or other similar methods will not be accepted.
2. Microphones. Provide a mic clip for each mic.
 - 6 @ Shure SM-58
 - 4 @ Shure SM-57
 - 1 @ Shure VP88
 - 1 @ Shure SD565
 - 2 @ AKG C414 XLS
 - 1 @ Rode NT4 stereo mic
 - 1 @ Countryman ISOMAX 4RF (M4HP5RF18EB) + AT8416 shockmount
 - 2 @ Audio Technica 4040.
 - 4 @ Audio Technica 4041.
 - 1 @ CT Audio; C-Ducer CP Series CSP/8P.
 - 5 @ Crown PCC160.
 - 3 @ Countryman Type 85 Direct Box.
 - 1 @ Emtech Electronics, Inc. Model EJ-10 multi-input adapter box.
 - 1 @ Whirlwind PCDI
 - 4 @ Audio Technica 853A hanging mics
 - 1 @ Audix DP7 drum mic kit
3. Microphone Stands & Accessories.
 - 24 @ Atlas Sound MS12CE
 - 16 @ K&M KM210/91 black, mic stand w/boom
 - 1 @ Atlas Sound D7
4. Intercom belt pack.
 - 12 @ Clear Com RS-601.
 - 3 @ Clear Com RS-602
5. Intercom speaker station (portable)
 - 2 @ Clear Com KB-701 w/ V-box
6. Intercom single muff headset.
 - 12 @ Clear Com CC-300
7. Intercom dual muff headset
 - 3 @ Clear Com CC-400
8. Intercom cable, 6 pin XLR
 - 5 @ 25 feet – Clear Com IC-25/6

9. Mic Cables: Whirlwind MKQ series in black.
 - 10 @ 10 feet
 - 40 @ 20 feet.
 - 30 @ 30 feet.
 - 10 @ 50 feet.
 - 6 @ 100 feet.
10. Speaker Cables.
 - 8 @ Whirlwind NL-4-50
 - 8 @ Whirlwind NL-4-25
11. Multi pair drop boxes.
 - 4 @ Whirlwind 50' 12pr stage box w/ W1 multi-pin connector
 - 2 @ Whirlwind 25' 12pr stage box w/ W1 multi-pin connector
12. Patch Cables and Adapters - Audio
 - 8 @ Neutrik NL4MM.
 - 2 @ Switchcraft 389.
 - 2 @ Switchcraft 390
 - 2 @ Switchcraft 387A
 - 2 @ Switchcraft 386A
 - 2 @ Switchcraft 384A
 - 2 @ Switchcraft 383A
13. Monitor Speakers.
 - 4 @ JBL MRX512M w/ stand sockets
 - 4 @ Galaxy Hot Spots with volume control and 2 NL4 connectors
 - 4 @ Ultimate Support TS-90B speaker stands
14. Video adapters & cables:
 - 6 @ Extron 15HD GCF
 - 4 @ Extron 15HD GCM
 - 2 @ Extron SVHSF-2BNCF
 - 2 @ Extron SVHSM-2BNCF
 - 20 @ Extron BNCF-BNCF
 - 4 @ Extron BNCF-BNCF T
 - 12 @ Extron RCAF-BNCF
 - 2 @ Extron DP-DVIDF
 - 2 @ Extron DP-HDMIF
 - 2 @ Extron HDMIF-DVIDF
 - 2 @ Extron HDMIF-DVIDM
 - 2 @ Extron HDMIM-DVIDF
 - 2 @ Extron DVIAM-VGAF PT
 - 2 @ Extron DVIAF-VGAM
 - 2 @ Extron VGA-A-M-M-MD/6
 - 2 @ Extron VGA-A-M-M-MD/35
 - 2 @ Extron VGA-A-M-F-MD/12
 - 2 @ Extron SYM BNCF/3

- 2 @ Extron SYM BNCM/3
- 2 @ Extron SYF BNCF/3
- 2 @ Extron SYF BNCM/3
- 4 @ Extron RG6-5 BNC/6
- 12 @ Extron RG6 BNC/6
- 2 @ Extron HDMI PRO/6
- 2 @ Extron DISPLAYPORT-M-M/6
- 2 @ Extron DVID DL PRO/6
- 2 @ Extron HDMI DVI-D/6
- 2 @ Extron HDTV RCA/6
- 2 @ Extron AV RCA/6
- 2 @ Extron MHR-2-SVMF/20

15. Headphones.
1 @ Sony MDR-7506

PART 3 - EXECUTION

3.01 SUBMITTALS:

- A. The sound contractor, within thirty days of the bid award and prior to beginning work, shall submit all of the following at the same time to the owner for approval:
- B. Drawings: Complete shop drawings details and complete on all phases of installation including a minimum of:
1. Device location plan drawing(s)
 2. System wiring diagram
 - a. Make and model of all equipment
 - b. All connection points on each piece of equipment
 - c. All wire types
 - d. All cable labels
 3. Rack elevations
 4. Details of all connection plates and custom panels
 5. Rack and equipment labels
 6. Mounting and rigging details for all equipment
 7. Drawing showing the projector, the screen, the throw distance and all lens calculations in both plan and section
- C. Mountings and Attachments: Prior to equipment installation, the sound contractor will submit to the owner detailed scale drawings of all proposed enclosures and speaker mounting or rigging weighing more than ten pounds. All mountings and attachments must be approved and stamped by an engineer licensed in Delaware prior to submittal and the beginning of the installation.
- D. Materials and Equipment: The sound contractor will submit to the owner a complete list of all materials and equipment to be furnished including catalog cuts for all equipment items. These must contain full information on dimensions, construction, applications, etc. to permit proper evaluation. In addition, they must be properly identified as to their intended use and any

options or variations must be clearly marked. The contractor is to confirm equipment availability at time of submittal. It is assumed that all equipment submitted on is and will be available.

- E. Test Equipment: The sound contractor will submit to the owner a list of test equipment to be used to test, equalize and demonstrate the final installation.
- F. Schedule: Prior to the commencement of the installation work, the sound contractor shall submit for approval, to the owner, an outline of a proposed commencement and completion schedule and project requirements.
- G. Variations: Any deviation from what is specified here and or shown on the system drawings must be “starred” and noted in ¼” high letters on the shop drawings and highlighted in the submittal data.
- H. Approval of shop drawings and materials does not relieve the Contractor of any responsibilities.

3.02 COORDINATION WITH OTHER WORK:

- A. The sound contractor shall specifically coordinate the placement and sizes of conduit relating to this work and shall specifically review and approve the conduit rough-in in time to advise all parties of needed changes, omissions, etc. The sound contractor shall report this successful coordination in writing to the owner's representative. Failing this, the following will be enforced:
 - 1. The sound contractor shall provide and install any additional conduits required for the hookup, proper location and proper isolation of the various cable / signal types and equipment in the systems. The sound contractor must coordinate his conduit installation with those installed by the electrical contractor. All conduits shall be sized to their intended fill plus fifty percent.
 - 2. The contractor shall at all times coordinate his work with the other trades to ensure smooth progress of work and satisfactory final results.

3.03 INSTALLATION:

- A. Personnel: A single, competent, technically qualified foreman will oversee the entire job from start to finish. This foreman must:
 - 1. Be present on the job site during all phases of installation and testing.
 - 2. Be authorized to receive instructions from the Architects or their representatives.
- B. Only experienced sound installers shall be employed on this job.
- C. The contractor shall keep the job adequately staffed at all times.
- D. All job documents pertaining to the installation of this system will be accessible to all workers throughout the installation process.

- E. Installation practices shall be in accordance with OSHA Safety and Health Standards and all local codes.
- F. The sound contractor shall not commence the installation of equipment and devices, other than the pulling of cable, until all areas are clean, painted and finished to a point that they are completely dust, dirt, lint, fiber and airborne particle free. The air conditioning system must be operating to its design level and be able to keep all areas with sound equipment stable.

G. General Workmanship:

- 1. The installation of all work shall be neat.
- 2. All boxes, equipment, etc shall be plumb and square.
- 3. The installation shall conform to the plans and spec.
- 4. Equipment racks shall be assembled, wired and tested in the contractors shop prior to delivery to the job site.

H. Wiring:

- 1. If enclosed in conduit run only similar signal levels in a single conduit.
- 2. All pulls to be made be hand, care will be taken not to nick cable jackets, and any nicked or damaged cable will be replaced.
- 3. A pull string will be left in all conduits after wire is installed.
- 4. **NO SPLICES WHATSOEVER IN CONDUIT!**
- 5. If not enclosed in conduit neatly group cables into bundles and secure out of harms way.
- 6. Separate cable grouping by signal level. Mic and A.C. power shall be not less than 18" all other levels by not less than 6".
- 7. Include spare cables with all field runs. Quantity to be 10% or 1 which ever is greater unless otherwise specified.

I. Terminations:

- 1. All cables shall be permanently labeled at every termination.
- 2. Service loops of not less than 6" will be present at all terminations to equipment.
- 3. Where terminal blocks or barrier strips are used only uninsulated fork terminals with a brazed seam, sized according to wire and stud sizes, crimped with notch across from the seam will be approved.
- 4. Use barrier strips on equipment where provided.
- 5. Where shielded cable is in use leave shield drain wire the same length as the circuit conductor(s), sleeve shield drain wire in green pvc tubing. Cap where the cable jacket was removed with heat shrink. Where the shield drain wire is to be lifted follow the above and fold back over cable jacket. Then cap end with heatshrink. Do not use a single piece of heatshrink for this use two smaller ones.
- 6. All soldering will be clean and neat and not exhibit evidence of a " cold" joint, were necessary heat sinks will be used. Use only rosin core "electronic type " solder.

7. Wire nuts will be allowed only for field connections of 70 volt speaker lines and priority attenuation control lines, and then only when the proper size is used.

J. Polarity:

1. The " high " side will be connected to pin 2 on XLR connectors, to tip on 1/4" connectors and to the pin on phono connectors.
2. The " low " side will be connected to pin 3 on XLR connectors, to ring on 1/4" balanced connectors and to case on phono connectors.
3. Microphones will be wired so that an acoustic compression at the diaphragm produces a positive going signal on pin 2 with respect to pin 3.
4. Speakers will be wired so that when a positive going signal is applied to the + or red terminal an acoustic compression is produced.
5. The system will be wired to maintain absolute polarity though all system components to insure that a positive signal on pin 2 or tip produces a positive signal at the + or red speaker terminal.

K. Shield Grounding:

1. Do not tie pin 1 to case of XLR connectors anywhere.
2. Microphone shield drain wires will be grounded only at mixer inputs. Where microphone lines and mixer inputs run though a patchbay, connect shield drain wire to sleeve of patchbay connector and only to this point.
3. Line level lines will have shield drain wire lifted from ground at outputs and connected to ground at inputs.
4. The intent here is to not make ground loops, should any situation arise which would form a ground loop, please inform the owner for direction.

L. Mountings and Attachments:

1. Any and all structural, mounting, or rigging details are shown on the drawings for concept only.
2. The detail drawings and calculations of all proposed mounting or rigging of any equipment weighing more than ten pounds will be approved and stamped by a P.E. who is licensed in Delaware.
3. Each cluster element is to be individually adjustable.
4. Provide for an adjustment range of +/- 10 degrees from the information shown in the contract documents.
5. In the absence of specific direction otherwise, standard rigging practices shall be followed.

M. Labels:

1. Cable Labels: All cables shall be labeled at all termination points. The label shall not be hand written. Clear heat shrink shall cover the label.
2. Equipment Labels. All equipment shall be labeled front and rear. Labels shall functionally describe the use of each piece of equipment. On equipment having multiple channels, each channel shall be labeled. Additionally the equipment

label will call out equipment designation which will correspond with the designations shown on the approved contractor's one-line diagram. Labels shall be engraved in anodized, white letters on black background, with a minimum letter size of 3/16". Approved patchbay labeling may vary from this.

- N. Power Sequencing. The system shall turn on and off, in proper order, on circuit at a time, when the power switch is pressed. The power light shall be solid on when all circuits are on , and shall flash during sequencing.
- O. The system may not be used prior to checkout.

3.04 INSPECTION AND TESTING:

- A. During the installation of the equipment the sound contractor shall arrange for access as necessary for inspection of equipment by the owner's and/or architect's representatives.
- B. Provide a safe means of accessing all system components for all visits.
- C. Equipment Pretesting: All racks are to be built and wired in contractor's shop and tested prior to delivery to site. All other equipment is to be tested prior to delivery and installation. A written test report will be submitted to the owner.
- D. Final Inspection:
 - 1. The final inspection will confirm that the systems, as installed, meets the requirements of this spec, the contract documents, and the approved contractor's shop drawing and submittals.
 - 2. The contractor will inform the owner in writing of the system's completion. The contractor will then request final inspection by the consultant, and carry out the necessary coordination. This coordination includes:
 - a. Giving at least fourteen days notice to the consultant prior to the final inspection.
 - b. Arranging for the contractor's and consultant's exclusive use of the space.
 - c. Arranging for a HVAC technician to be available to turn the AC system on and off as required.
 - d. Arranging for a lighting technician to be available to control the stage lighting as required.
 - e. The contractor's job foreman and one additional worker familiar with the job will be present during all check out, testing and tuning.
 - 3. Contractor will complete the following tasks prior to consultant's arrival:
 - a. Unpack and assemble all portable equipment.
 - b. Place all portable equipment in one location.
 - c. If anything has been turned over to the owner have the signed Letters of Transmittal on site.
 - d. Complete all required paperwork (pre-testing reports, letters indicating successful coordination of the installation, etc.).
 - e. Remove all security covers.

- f. Contractor will provide all necessary software, cables, and interfaces to facilitate the setting of computer, remote controlled, or DSP based equipment.
 - g. Contractor will either: 1) relocate all system equalizers to a tech area in the house for the duration of system tuning or 2) for remotely controllable devices, locate the control position in a tech area in the house for the duration of system testing. In either case a tech area in the house will be required with a minimum of a 4' x 6' folding table, intercom communications to the rack and console locations, and AC power.
 4. Contractor will provide the following test equipment for use during tuning and acceptance testing:
 - a. Sennheiser ZP-3 impedance bridge.
 - b. Low distortion sine wave oscillator with variable sweep (start frequency, stop frequency, and sweep rate).
 - c. Distortion meter.
 - d. Oscilloscope dual channel, 100Mhz, .001v/div vertical amp.
 - e. Noise generator that will provide pink, white, or bandwidth limited pink noise.
 - f. 1/3 octave real time audio spectrum analyzer.
 - g. Precision sound level meter with filter set.
 - h. Polarity checker.
 - i. Precision true R.M.S. reading A.C. millivolt meter with dB scale.
 - j. Playback and recording media for testing all supplied source equipment.
 5. Contractor will provide safe means to access all system components during the entire commissioning process.
 6. Contractor shall provide personal and equipment to make adjustments to the speaker cluster(s), as well as to correct problems, for the entire inspection and testing period.
- E. The Theatre Consultant or his representative will conduct all final system tests and equalization adjustments in order to determine final acceptance.
- F. In no event shall the theatrical sound systems installation be submitted for final approval or acceptance until any and all elements of the facility that may have a bearing on the system performance, including but not limited to doors, windows, HVAC, carpeting, furniture, wall coverings, interior design elements, lighting and lighting control systems have been completed and are operable. All elements that may effect sound systems operation or performance shall be "on" and operating during adjustments. The sound contractor will be responsible for coordinating the requirements of this paragraph with other work on the project.
- G. Should more than two trips be required to complete the systems testing, systems tuning, and clearing punch list items, the contractor will be charged for any additional visits. These charges will include:
 1. A minimum of two people at a rate of \$1250 per day per person.
 2. Travel expense to and from the job site.
 3. These charges will be paid to the consultant, in advance of the consultant's arrival on the job site.

3.05 MANUALS:

A. Prepare four identical copies of owner's manuals. The owner is to receive two, the consultant receives one and the contractor retains one. Before distribution of manuals submit one copy to consultant for approval. Each manual is to contain the following:

1. System one line drawing including all labeling and changes (" as built ").
2. Owners manual for each piece of equipment.
3. Schematic diagram for each piece of equipment.
4. Contractors service phone number in a conspicuous place.
5. All test reports.

3.06 INSTRUCTION: The following is to be carried out within two months of system acceptance:

- A. Provide a total of 12 hours of instruction, on a maximum of two occasions. This is to be time on site, travel time is not to be included within the allotted time.
- B. Provide operational assistance for the first usage of the system. This is to be on the owners time schedule but, not to exceed 8 hours.

3.07 WARRANTY

- A. Contractor will warrant the system to be free from defects in materials and workmanship for a period of one year from the date of acceptance, or first beneficial use, which ever comes first.
- B. Acts of god and owner abuse, or neglect are not covered.
- C. During the warranty period the contractor will respond to and correct any call for service within one day of the call. Loaner equipment will be provided if necessary.

END OF SECTION 274118