PROJECT MANUAL

Brandywine School District

ISSUE FOR MY MARKETPLACE

TETRA TECH
240 Continental Drive, Suite 200
Newark, Delaware 19713
phone: 302.738.7551
fax: 302.454.5989

Brandywine School District
1311 Brandywine Boulevard
Wilmington, DE 19809

BRANDYWINE SCHOOL DISTRICT
WILMINGTON, DELAWARE

FACILITIES DEPARTMENT
RELOCATION

BSD Contract #:
BSD18004-GCSERVICES-FACILITIES

New Castle County, Delaware

200-15704-17002

February 28, 2018

TIMOTHY SKIBICKI
NO. 0636
STATE OF DELAWARE
REGISTERED ARCHITECT

NOT FOR BIDDING PURPOSES

FACILITIES DEPARTMENT RELOCATION
FOR THE
BRANDYWINE SCHOOL DISTRICT
WILMINGTON, DELAWARE
BSD Contract #: BSD18004-GCSERVICES-FACILITIES

NOT FOR BIDDING PURPOSES

PROJECT TEAM

OWNER: Brandywine School District
1311 Brandywine Boulevard
Wilmington, DE 19809

ARCHITECT: Tetra Tech, Inc.
240 Continental Drive
Suite 200
Newark, DE 19713
Phone: 302-738-7551 Fax: 302-454-5989

MEP ENGINEER: Furlow Associates, Inc.
1206 Society Drive
Claymont, DE 19703
Phone: 302-798-3515

CIVIL ENGINEER: CDA Engineering, Inc.
6 Larch Avenue, Suite 401
Wilmington, DE 19804
Phone: 302-998-9202

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DELAWARE PREVAILING WAGE RATES

State of Delaware, Department of Labor, Prevailing Wages. Provided in accordance with Delaware's Prevailing Wage Regulations.

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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, 2017

CLASSIFICATION	NEW CASTLE	KENT	SUSSEX
ASBESTOS WORKERS	22.86	28.16	40.98
BOILERMAKERS	68.44	34.72	51.05
BRICKLAYERS	51.99	51.99	51.99
CARPENTERS	53.81	53.81	42.77
CEMENT FINISHERS	72.28	46.72	22.17
ELECTRICAL LINE WORKERS	45.47	38.90	29.73
ELECTRICIANS	66.85	66.85	66.85
ELEVATOR CONSTRUCTORS	90.49	54.49	31.94
GLAZIERS	71.20	71.20	56.66
INSULATORS	55.48	55.48	55.48
IRON WORKERS	62.85	62.85	62.85
LABORERS	44.70	44.70	44.70
MILLWRIGHTS	69.18	69.18	55.75
PAINTERS	48.47	48.47	48.47
PILEDRIVERS	39.27	39.35	31.83
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TRUCK DRIVERS	28.75	27.44	20.94

CERTIFIED: 02/27/2018 BY: _____
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: Brandywine Scool District - Facilities Relocation, New Castle County

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INVITATION TO BID

Sealed bids for **Contract No. # BSD18004-GCSERVICES-FACILITIES – Brandywine School District – District Facility Department Building Renovation and Addition**, will be received by the Brandywine School District, at the Facilities Management Building, 3305 Green Street, Claymont, DE 19703, until 2:00 p.m. local time on April 18, 2018, at which time they will be publicly opened and read aloud in the Conference Room. Bidder bears the risk of late delivery. Any bids received after the stated time will be returned unopened.

Project involves the renovation and an approximately 6,900 square foot addition to a currently unoccupied shell building located at 1000 Pennsylvania Avenue, Claymont, DE 19703. The completed project will consist of shop and office program areas. The construction work will include but not be limited to: mechanical, electrical, plumbing, structural, fire suppression, fire alarm as well as interior and exterior architectural improvements.

A **MANDATORY** Pre-Bid Meeting will be held on March 22, 2018, at 2:00 p.m.at the project site, 1000 Pennsylvania Avenue, Claymont, DE 19703 for the purpose of establishing the listing of subcontractors and to answer questions. Representatives of each party to any Joint Venture must attend this meeting. **ATTENDANCE OF THIS MEETING IS A PREREQUISITE FOR BIDDING ON THIS CONTRACT.**

Sealed bids shall be addressed to the Brandywine School District, Facilities Management, 3305 Green Street, Claymont, DE 19703. The outer envelope should clearly indicate: **"CONTRACT No. 18004-GCSERVICES-FACILITIES – Brandywine School District – District Facility Department Building Renovation and Addition - SEALED BID - DO NOT OPEN.**

A disk containing Contract documents may be obtained at the office of Tetra Tech, 240 Continental Drive, Suite 200, Newark DE 19713 , upon receipt of $50 per set/non-refundable. Checks are to be made payable to "Tetra Tech."

Construction documents will be available for review at the following locations: Tetra Tech Office.

Bidders will not be subject to discrimination on the basis of race, creed, color, sex, sexual orientation, gender identity or national origin in consideration of this award, and Minority Business Enterprises, Disadvantaged Business Enterprises, Women-Owned Business Enterprises and Veteran-Owned Business Enterprises will be afforded full opportunity to submit bids on this contract. Each bid must be accompanied by a bid security equivalent to ten percent of the bid amount and all additive alternates. The successful bidder must post a performance bond and payment bond in a sum equal to 100 percent of the contract price upon execution of the contract. The Owner reserves the right to reject any or all bids and to waive any informalities therein. The Owner may extend the time and place for the opening of the bids from that described in the advertisement, with not less than two calendar days notice by certified delivery, facsimile machine or other electronic means to those bidders receiving plans.

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INSTRUCTION TO BIDDERS

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ARTICLE 1: GENERAL

1.1 DEFINITIONS

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

1.2 STATE: The State of Delaware.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 2: BIDDER'S REPRESENTATIONS

2.1 PRE-BID MEETING

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

2.2 By submitting a Bid, the Bidder represents that:

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

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

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

2.3 JOINT VENTURE REQUIREMENTS

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

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

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

2.3.4 All required insurance certificates shall name both Joint Venturers.

2.3.5 Both Joint Venturers shall sign the Bid Form and shall submit a copy of a valid Delaware Business License with their Bid.

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

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

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

2.4 ASSIGNMENT OF ANTITRUST CLAIMS

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

ARTICLE 3: BIDDING DOCUMENTS

3.1 COPIES OF BID DOCUMENTS

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

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

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

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

3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

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

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

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

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

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

3.3 SUBSTITUTIONS

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

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3.3.2 Requests for substitutions shall be made in writing to the Architect at least ten days prior to the date of the Bid Opening. Such requests shall include a complete description of the proposed substitution, drawings, performance and test data, explanation of required installation modifications due the substitution, and any other information necessary for an evaluation. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval shall be final. The Architect is to notify Owner prior to any approvals.

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

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

3.4 ADDENDA

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

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

3.4.3 No Addenda will be issued later than 4 days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which extends the time or changes the location for the opening of bids.

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

ARTICLE 4: BIDDING PROCEDURES

4.1 PREPARATION OF BIDS

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

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

4.1.3 Execute all blanks on the Bid Form in a non-erasable medium (typewriter or manually in ink).

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

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4.1.5 Interlineations, alterations or erasures must be initialed by the signer of the Bid.

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

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

4.1.8 Each copy of the Bid shall include the legal name of the Bidder and a statement whether the Bidder is a sole proprietor, a partnership, a corporation, or any legal entity, and each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current Power of Attorney attached, certifying agent's authority to bind the Bidder.

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

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

4.1.11 Each bidder shall include in their bid a copy of a valid Delaware Business License.'

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

4.2 BID SECURITY

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

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

NOT FOR BIDDING PURPOSES

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

4.3 SUBCONTRACTOR LIST

4.3.1 As required by Delaware Code, Title 29, section 6962(d)(10)b, each Bidder shall submit with their Bid a completed List of Sub-Contractors included with the Bid Form. NAME ONLY ONE SUBCONTRACTOR FOR EACH TRADE. A Bid will be considered non-responsive unless the completed list is included.

4.3.2 Provide the Name and Address for each listed subcontractor. Addresses by City, Town or Locality, plus State, will be acceptable.

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

4.4 EQUALITY OF EMPLOYMENT OPPORTUNITY ON PUBLIC WORKS

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

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

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

4.5 PREVAILING WAGE REQUIREMENT

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

NOT FOR BIDDING PURPOSES

4.5.2 The employer 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.

4.5.3 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.

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

4.6 SUBMISSION OF BIDS

4.6.1 Enclose the Bid, the Bid Security, and any other documents required to be submitted with the Bid in a sealed opaque envelope. Address the envelope to the party receiving the Bids. Identify with the project name, project number, and the Bidder's name and address. If the Bid is sent by mail, enclose the sealed envelope in a separate mailing envelope with the notation "BID ENCLOSED" on the face thereof. The State is not responsible for the opening of bids prior to bid opening date and time that are not properly marked.

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

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

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

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

4.7 MODIFICATION OR WITHDRAW OF BIDS

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

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

4.7.3 A Bid may not be modified, withdrawn or canceled by the Bidder during a thirty (30) day period following the time and date designated for the receipt and opening of Bids, and

NOT FOR BIDDING PURPOSES

Bidder so agrees in submitting their Bid. Bids shall be binding for 30 days after the date of the Bid opening.

ARTICLE 5: CONSIDERATION OF BIDS

5.1 OPENING/REJECTION OF BIDS

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

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

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

5.2 COMPARISON OF BIDS

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

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

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

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

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

5.3 DISQUALIFICATION OF BIDDERS

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

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

B. The Bidder's record of performance on past public or private construction projects, including, but not limited to, defaults and/or final adjudication or

NOT FOR BIDDING PURPOSES

admission of violations of the Prevailing Wage Laws in Delaware or any other state;

C. The Bidder's written safety plan;

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

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

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

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

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

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

5.3.3.2 Evidence of collusion among Bidders.

5.3.3.3 Unsatisfactory performance record as evidenced by past experience.

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

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

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

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

5.4 ACCEPTANCE OF BID AND AWARD OF CONTRACT

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

5.4.2 Per Section 6962(d)(13) a., Title 29, Delaware Code, "The contracting agency shall award any public works contract within thirty (30) days of the bid opening to the lowest responsive and responsible Bidder, unless the Agency elects to award on the basis of best value, in which case the election to award on the basis of best value shall be stated in the Invitation To Bid."

NOT FOR BIDDING PURPOSES

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

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

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

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

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

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

ARTICLE 6: POST-BID INFORMATION

6.1 CONTRACTOR'S QUALIFICATION STATEMENT

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

NOT FOR BIDDING PURPOSES

6.2 BUSINESS DESIGNATION FORM

6.2.1 Successful bidder shall be required to accurately complete an Office of Management and Budget Business Designation Form for Subcontractors.

ARTICLE 7: PERFORMANCE BOND AND PAYMENT BOND

7.1 BOND REQUIREMENTS

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

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

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

7.2 TIME OF DELIVERY AND FORM OF BONDS

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

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

ARTICLE 8: FORM OF AGREEMENT BETWEEN AGENCY AND CONTRACTOR

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

END OF SECTION

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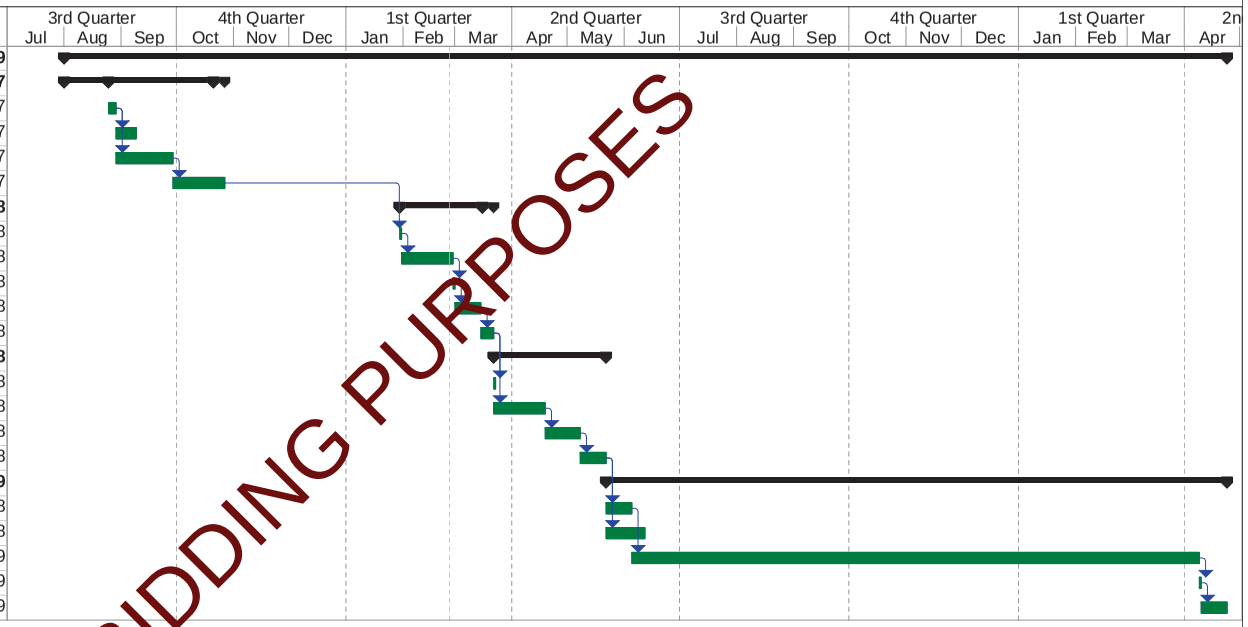
Brandywine Facilities Building

PROJECT SCHEDULE

February 26, 2018

ID	Task Name	Duration	Start	Finish
0	**Brandywine SD Projects**	**451 days**	**Tue 8/1/17**	**Tue 4/23/19**
1	**Design Development**	**59 days**	**Tue 8/1/17**	**Fri 10/20/17**
2	*AAB Review Submission*	2 days	Fri 8/25/17	Mon 8/28/17
3	AAB Approval	9 days	Tue 8/29/17	Fri 9/8/17
4	Production Period	23 days	Tue 8/29/17	Thu 9/28/17
5	*DFM Review*	20 days	Fri 9/29/17	Thu 10/26/17
6	**Construction Documents**	**33 days**	**Tue 1/30/18**	**Thu 3/15/18**
7	Design Phase	1 day	Tue 1/30/18	Tue 1/30/18
8	*DFM Review*	20 days	Wed 1/31/18	Tue 2/27/18
9	Complete Design Documents	1 day	Wed 2/28/18	Wed 2/28/18
10	Submit to GSS	10 days	Thu 3/1/18	Wed 3/14/18
11	Advertise for Bidding	5 days	Thu 3/15/18	Wed 3/21/18
12	**Bidding/ Negotiation Phase**	**43 days**	**Thu 3/22/18**	**Mon 5/21/18**
13	Pre-bid meeting	1 day	Thu 3/22/18	Thu 3/22/18
14	Bidding Period	20 days	Thu 3/22/18	Wed 4/18/18
15	Board Approval	13 days	Thu 4/19/18	Mon 5/7/18
16	Contract Period	10 days	Tue 5/8/18	Mon 5/21/18
17	**Construction Phase**	**241 days**	**Tue 5/22/18**	**Tue 4/23/19**
18	Permit	10 days	Tue 5/22/18	Mon 6/4/18
19	Submittal Phase	15 days	Tue 5/22/18	Mon 6/11/18
20	Mobilization and Construction	220 days	Tue 6/5/18	Mon 4/8/19
21	Substantial Completion	1 day	Tue 4/9/19	Tue 4/9/19
22	Final Completion	10 days	Wed 4/10/19	Tue 4/23/19



NOT FOR BIDDING PURPOSES

Summary	DFM/ OMB	Inactive Milestone	Duration-only	Start-only
Milestone	Construction	Inactive Summary	Manual Summary Rollup	Finish-only
Tetra Tech	Inactive Task	Manual Task	Manual Summary	

FACILITIES DEPARTMENT RELOCATION
FOR THE
BRANDYWINE SCHOOL DISTRICT
WILMINTON, DE 19809
200-15704-17002
BSD Contract #: BSD18004-GCSERVICES-FACILITIES

BID FORM

For Bids Due: _____(DATE)_____ **To:** _____(OWNER)_____

Name of Bidder: _____

Delaware Business License No.: _____ **Taxpayer ID No.:** _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

(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

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

ALTERNATE No. 1: _____(BRIEF DESCRIPTION)_____

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:

		ADD	**DEDUCT**
UNIT PRICE No. 1:	_____(BRIEF DESCRIPTION)_____	$ _____	$ _____

NOT FOR BIDDING PURPOSES

FACILITIES DEPARTMENT RELOCATION
FOR THE
BRANDYWINE SCHOOL DISTRICT
WILMINTON, DE 19809
200-15704-17002
BSD Contract #: BSD18004-GCSERVICES-FACILITIES

BID FORM

NOT FOR BIDDING PURPOSES

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 thirty (30) days from the date of opening of bids (60 days for School Districts and Department of Education), and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid.

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

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

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _____calendar days of the Notice to Proceed.

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

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

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

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

_____
(State of Corporation)

Business Address:_____
_____
_____
_____

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

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Affidavit(s) of Employee Drug Testing Program
Bid Security
(Others as Required by Project Manuals)

FACILITIES DEPARTMENT RELOCATION
FOR THE
BRANDYWINE SCHOOL DISTRICT
WILMINTON, DE 19809
200-15704-17002
BSD Contract #: BSD18004-GCSERVICES-FACILITIES

BID FORM

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.** This form must be filled out completely with no additions or deletions. **Note that all subcontractors listed below must have a signed Affidavit of Employee Drug Testing Program included with this bid.**

Subcontractor Category	Subcontractor	Address (City & State)	Subcontractors tax payer ID # or Delaware Business license #
1. Mechanical			
2. Electrical			
3. Concrete			
4. Plumbing			
5. Carpentry			
6. Painting			
7. Floor Covering			
8. Fire Suppression			

NOT FOR BIDDING PURPOSES

FACILITIES DEPARTMENT RELOCATION
FOR THE
BRANDYWINE SCHOOL DISTRICT
WILMINTON, DE 19809
200-15704-17002
BSD Contract #: BSD18004-GCSERVICES-FACILITIES

BID FORM

NON-COLLUSION STATEMENT

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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 *(to the Office of Management and Budget, Division of Facilities Management)*.

All the terms and conditions of *(Project or Contract Number)* have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

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

My Commission Expires _____. NOTARY PUBLIC _____.

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

FACILITIES DEPARTMENT RELOCATION
FOR THE
BRANDYWINE SCHOOL DISTRICT
WILMINTON, DE 19809
200-15704-17002
BSD Contract #: BSD18004-GCSERVICES-FACILITIES

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

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

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

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

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

My Commission expires _____. NOTARY PUBLIC _____.

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

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NOT FOR BIDDING PURPOSES

STATE OF DELAWARE

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 **State** in the sum of _____ _____ Dollars ($_____), or _____ percent not to exceed _____ _____ Dollars ($_____) of amount of bid on Contract No. _____, to be paid to the **State** for the use and benefit of _____ (***insert State agency name***) for which payment well and truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bonded **Principal** who has submitted to the _____ (***insert State agency name***) 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 _____ _____ (***insert State agency name***) 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:_____

By: _____

_____
Title

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STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

The Standard Form of Agreement Between Owner and Contractor is as stated in the American Institute of Architects Document AIA A101 (2007 Edition) entitled Standard Form of Agreement Between Owner and Contractor and is part of this project manual as if herein written in full.

A draft copy of this document is included herein as follows.

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AIA® Document A101™ – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the day of in the year
(In words, indicate day, month and year.)

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

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

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

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

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. 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.

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

NOT FOR BIDDING PURPOSES

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User Notes:

(3B9ADA21)

TABLE OF ARTICLES

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6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A 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 a Modification, 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:
(Check one of the following boxes.)

[ ] The date of this Agreement.

[ ] A date set forth in a notice to proceed issued by the Owner.

[ ] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

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

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:

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(Check one of the following boxes and complete the necessary information.)

[ ] Not later than ( ) calendar days from the date of commencement of the Work.

[ ] By the following date:

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

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ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued 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 Architect not later than the day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than ( ) days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 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.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- **.1** That portion of the Contract Sum properly allocable to completed Work;
- **.2** That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- **.5** Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

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§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 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 Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and
- **.2** a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

§ 5.3 Interest
Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

%

ARTICLE 6 DISPUTE RESOLUTION
§ 6.1 Initial Decision Maker
The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the 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.)

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§ 6.2 Binding Dispute Resolution
For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[ ] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[ ] Litigation in a court of competent jurisdiction

[ ] Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION
§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS
§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

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

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

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

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:

(Insert the date of the E203–2013 incorporated into this Agreement.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

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

.8 Other Exhibits:

(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

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[ ] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

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

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*

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SPEC SECTION 00 54 13

SUPPLEMENT TO AGREEMENT BETWEEN OWNER AND CONTRACTOR A101-2007

The following supplements modify the "Standard Form of Agreement Between Owner and Contractor," AIA Document A101-2007. Where a portion of the Standard Form of Agreement is modified or deleted by the following, the unaltered portions of the Standard Form of Agreement shall remain in effect.

ARTICLE 5: PAYMENTS

5.1 PROGRESS PAYMENTS

5.1.3 Delete paragraph 5.1.3 in its entirety and replace with the following:

"Provided that a valid Application for Payment is received by the Architect that meets all requirements of the Contract, payment shall be made by the Owner not later than 30 days after the Owner receives the valid Application for Payment."

ARTICLE 6: DISPUTE RESOLUTION

6.2 BINDING DISPUTE RESOLUTION

Check Other – and add the following sentence:

"Any remedies available in law or in equity."

ARTICLE 8: MISCELLANEOUS PROVISIONS

8.2 Insert the following:

"Payments are due 30 days after receipt of a valid Application for Payment. After that 30 day period, interest may be charged at the rate of 1% per month not to exceed 12% per annum."

8.5 Delete paragraph 8.5 in its entirety and replace with the following:

"The Contractor's representative shall not be changed without ten days written notice to the Owner."

END OF SUPPLEMENT TO AGREEMENT BETWEEN OWNER AND CONTRACTOR

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STATE OF DELAWARE
OFFICE OF MANAGEMENT AND BUDGET

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 _____ ("**Owner**") (***insert State agency name***), 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

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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)

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STATE OF DELAWARE
OFFICE OF MANAGEMENT AND BUDGET

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 _____ ("**Owner**") (***insert State agency name***), 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, assignments, subcontracts and transfers and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to **Surety** as though done or omitted to be done by or in relation to **Principal**.

Surety hereby stipulates and agrees that no modifications, omission or additions in or to the terms of the Contract shall in any way whatsoever affect the obligation of **Surety** and its bond.

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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)

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AIA® Document G701™ – 2001

Change Order

PROJECT *(Name and address)*:	**CHANGE ORDER NUMBER:**	OWNER: ☐
	DATE:	ARCHITECT: ☐
TO CONTRACTOR *(Name and address)*:	**ARCHITECT'S PROJECT NUMBER:**	CONTRACTOR: ☐
	CONTRACT DATE:	FIELD: ☐
	CONTRACT FOR:	OTHER: ☐

THE CONTRACT IS CHANGED AS FOLLOWS:
(Include, where applicable, any undisputed amount attributable to previously executed Construction Change Directives)

The original Contract Sum was	$ 0.00
The net change by previously authorized Change Orders	$ 0.00
The Contract Sum prior to this Change Order was	$ 0.00
The Contract Sum will be by this Change Order in the amount of	$ 0.00
The new Contract Sum including this Change Order will be	$ 0.00

The Contract Time will be by ( ) days.
The date of Substantial Completion as of the date of this Change Order therefore is

NOTE: This Change Order does not include changes in the Contract Sum, Contract Time or Guaranteed Maximum Price which have been authorized by Construction Change Directive until the cost and time have been agreed upon by both the Owner and Contractor, in which case a Change Order is executed to supersede the Construction Change Directive.

NOT VALID UNTIL SIGNED BY THE ARCHITECT, CONTRACTOR AND OWNER.

ARCHITECT *(Firm name)*	**CONTRACTOR** *(Firm name)*	**OWNER** *(Firm name)*
ADDRESS	**ADDRESS**	**ADDRESS**
BY *(Signature)*	**BY** *(Signature)*	**BY** *(Signature)*
(Typed name)	*(Typed name)*	*(Typed name)*
DATE	**DATE**	**DATE**

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AIA® Document G702™ – 1992

Application and Certificate for Payment

TO OWNER:	**PROJECT:**	**APPLICATION NO:**	**Distribution to:**
		PERIOD TO:	OWNER: ☐
		CONTRACT FOR:	ARCHITECT: ☐
FROM CONTRACTOR:	**VIA ARCHITECT:**	**CONTRACT DATE:**	CONTRACTOR: ☐
		PROJECT NOS: / /	FIELD: ☐
			OTHER: ☐

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM ..... $ _____

2. Net change by Change Orders ..... $ _____

3. CONTRACT SUM TO DATE (Line 1 ± 2) ..... $ _____

4. TOTAL COMPLETED & STORED TO DATE (Column G on G703) ..... $ _____

5. RETAINAGE:

a. _____ % of Completed Work
(Column D + E on G703) $ _____

b. _____ % of Stored Material
(Column F on G703) $ _____

Total Retainage (Lines 5a + 5b or Total in Column I of G703) ..... $ _____

6. TOTAL EARNED LESS RETAINAGE ..... $ _____
(Line 4 Less Line 5 Total)

7. LESS PREVIOUS CERTIFICATES FOR PAYMENT ..... $ _____
(Line 6 from prior Certificate)

8. CURRENT PAYMENT DUE ..... $ _____

9. BALANCE TO FINISH, INCLUDING RETAINAGE
(Line 3 less Line 6) $ _____

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$	$
Total approved this Month	$	$
TOTALS	$	$
NET CHANGES by Change Order	$	

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of:

County of:

Subscribed and sworn to before me this day of

Notary Public:

My Commission expires:

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED ..... $ _____

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract

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AIA® Document G703™ – 1992

Continuation Sheet

AIA Document G702, APPLICATION AND CERTIFICATION FOR PAYMENT, containing Contractor's signed certification is attached.
In tabulations below, amounts are stated to the nearest dollar.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO:

A	B	C	D	E	F	G		H	I
			WORK COMPLETED						
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
	GRAND TOTAL	$	$	$	$	$		$	$

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User Notes:

(3788070103)

AIA® Document G704™ – 2000

Certificate of Substantial Completion

PROJECT:
(Name and address):

PROJECT NUMBER: /
CONTRACT FOR:
CONTRACT DATE:

OWNER: ☐
ARCHITECT: ☐
CONTRACTOR: ☐
FIELD: ☐
OTHER: ☐

TO OWNER:
(Name and address):

TO CONTRACTOR:
(Name and address):

PROJECT OR PORTION OF THE PROJECT DESIGNATED FOR PARTIAL OCCUPANCY OR USE SHALL INCLUDE:

The Work performed under this Contract has been reviewed and found, to the Architect's best knowledge, information and belief, to be substantially complete. Substantial Completion is the stage in the progress of the Work when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of the Project or portion designated above is the date of issuance established by this Certificate, which is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:

Warranty **Date of Commencement**

ARCHITECT	BY	DATE OF ISSUANCE

A list of items to be completed or corrected is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Unless otherwise agreed to in writing, the date of commencement of warranties for items on the attached list will be the date of issuance of the final Certificate of Payment or the date of final payment.

Cost estimate of Work that is incomplete or defective: $

The Contractor will complete or correct the Work on the list of items attached hereto within ( ) days from the above date of Substantial Completion.

CONTRACTOR	BY	DATE

The Owner accepts the Work or designated portion as substantially complete and will assume full possession at (time) on (date).

OWNER	BY	DATE

The responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance shall be as follows:
(Note: Owner's and Contractor's legal and insurance counsel should determine and review insurance requirements and coverage.)

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AIA® Document G706™ – 1994

Contractor's Affidavit of Payment of Debts and Claims

PROJECT: *(Name and address)*

TO OWNER: *(Name and address)*

ARCHITECT'S PROJECT NUMBER:

CONTRACT FOR:

CONTRACT DATED:

OWNER: ☐
ARCHITECT: ☐
CONTRACTOR: ☐
SURETY: ☐
OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. AIA Document G707, Consent of Surety, may be used for this purpose

Indicate Attachment ☐ Yes ☐ No

The following supporting documents should be attached hereto if required by the Owner:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.

2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers to the extent required by the Owner, accompanied by a list thereof.

3. Contractor's Affidavit of Release of Liens (AIA Document G706A).

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

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AIA® Document G706A™ – 1994

Contractor's Affidavit of Release of Liens

PROJECT: *(Name and address)*

TO OWNER: *(Name and address)*

ARCHITECT'S PROJECT NUMBER:

CONTRACT FOR:

CONTRACT DATED:

OWNER: ☐
ARCHITECT: ☐
CONTRACTOR: ☐
SURETY: ☐
OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.

2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

CONTRACTOR: *(Name and address)*

BY: _____

(Signature of authorized representative)

_____

(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

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AIA® Document G707™ – 1994

Consent Of Surety to Final Payment

PROJECT: *(Name and address)*	**ARCHITECT'S PROJECT NUMBER:**	OWNER: ☐
	CONTRACT FOR:	ARCHITECT: ☐
		CONTRACTOR: ☐
TO OWNER: *(Name and address)*	**CONTRACT DATED:**	SURETY: ☐
		OTHER: ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

_____
(Surety)

_____
(Signature of authorized representative)

Attest:
(Seal):

_____
(Printed name and title)

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AIA® Document G710™ – 1992

Architect's Supplemental Instructions

PROJECT *(Name and address)*:

ARCHITECT'S SUPPLEMENTAL INSTRUCTION NO:

OWNER: ☐
ARCHITECT: ☐
CONSULTANT: ☐
CONTRACTOR: ☐
FIELD: ☐
OTHER: ☐

OWNER *(Name and address)*:

DATE OF ISSUANCE:

CONTRACT FOR:

FROM ARCHITECT *(Name and address)*:

CONTRACT DATE:

TO CONTRACTOR *(Name and address)*:

ARCHITECT'S PROJECT NUMBER:

The Work shall be carried out in accordance with the following supplemental instructions issued in accordance with the Contract Documents without change in Contract Sum or Contract Time. Proceeding with the Work in accordance with these instructions indicates your acknowledgment that there will be no change in the Contract Sum or Contract Time.

DESCRIPTION:

ATTACHMENTS:
(Here insert listing of documents that support description.)

ISSUED BY THE ARCHITECT

(Signature) _____ *(Printed name and title)* _____

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AIA® Document G714™ – 2007

Construction Change Directive

PROJECT: *(Name and address)*

TO CONTRACTOR: *(Name and address)*

DIRECTIVE NUMBER:
DATE:
CONTRACT FOR:

CONTRACT DATED:
ARCHITECT'S PROJECT NUMBER:

OWNER: ☐
ARCHITECT: ☐
CONSULTANT: ☐
CONTRACTOR: ☐
FIELD: ☐
OTHER: ☐

You are hereby directed to make the following change(s) in this Contract:
(Describe briefly any proposed changes or list any attached information in the alternative)

PROPOSED ADJUSTMENTS

1. The proposed basis of adjustment to the Contract Sum or Guaranteed Maximum Price is:
   - ☐ • Lump Sum of $
   - ☐ • Unit Price of $ per
   - ☐ • As provided in Section 7.3.3 of AIA Document A201–2007
   - ☐ • As follows:

2. The Contract Time is proposed to . The proposed adjustment, if any, is .

When signed by the Owner and Architect and received by the Contractor, this document becomes effective IMMEDIATELY as a Construction Change Directive (CCD), and the Contractor shall proceed with the change(s) described above.

Contractor signature indicates agreement with the proposed adjustments in Contract Sum and Contract Time set forth in this CCD.

ARCHITECT *(Firm name)*	**OWNER** *(Firm name)*	**CONTRACTOR** *(Firm name)*
ADDRESS	**ADDRESS**	**ADDRESS**
BY *(Signature)*	**BY** *(Signature)*	**BY** *(Signature)*
(Typed name)	*(Typed name)*	*(Typed name)*
DATE	**DATE**	**DATE**

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AIA® Document G715™ – 1991

Supplemental Attachment for ACORD Certificate of Insurance 25-S

(This document replaces AIA Document G705, Certificate of Insurance.)

PROJECT *(Name and address)*:

INSURED _____

	Yes	No	N/A
A. General Liability			
1. Does the General Aggregate apply to this Project only?	☐	☐	☐
2. Does this policy include coverage for:			
a. Premises - Operations?	☐	☐	☐
b. Explosion, Collapse and Underground Hazards?	☐	☐	☐
c. Personal Injury Coverage?	☐	☐	☐
d. Products Coverage?	☐	☐	☐
e. Completed Operations?	☐	☐	☐
f. Contractual Coverage for the Insured's obligations in A201?	☐	☐	☐
3. If coverage is written on a claims-made basis, what is the:			
a. Retroactive Date?			
b. Extended Reporting Date?			
B. Worker's Compensation			
1. If the Insured is exempt from Worker's Compensation statutes, does the Insured carry the equivalent Voluntary Compensation coverage?	☐	☐	☐
C. Final Payment Information			
1. Is this certificate being furnished in connection with the Contractor's request for final payment in accordance with the requirements of Sections 9.10.2 and 11.1.3 of AIA Document A201, General Conditions of the Contract for Construction?	☐	☐	☐
2. If so, and if the policy period extends beyond termination of the Contract for Construction, is Completed Operations coverage for this Project continued for the balance of the policy period?	☐	☐	☐
D. Termination Provisions			
1. Has each policy shown on the certificate and this Supplement been endorsed to provide the holder with 30 days notice of cancellation and/or expiration? List below any policies which do not contain this notice.	☐	☐	☐
E. Other Provisions			

_____
Authorized Representative

_____
Date of Issue

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SECTION 00 72 13

GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

The General Conditions of this Contract are as stated in the American Institute of Architects Document AIA A201 (2007 Edition) entitled General Conditions of the Contract for Construction and is part of this project manual as if herein written in full.

A draft copy of this document is included herein as follows.

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AIA® Document A201™ – 2007

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. 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.

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Init.
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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 a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's 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 the Owner and by separate contractors.

§ 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.

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§ 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's 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 Section 4.2.1, the Architect does 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

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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.

§ 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.

§ 2.3 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 Architect's 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. 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 Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 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 Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

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§ 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 Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the 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 Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the 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 instructions 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 and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. 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 or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work 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.

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§ 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 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 and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the 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 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 Contractor shall secure and pay for the building permit as well as 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 and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect 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 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 and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that 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 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.

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§ 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 through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect 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 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 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 to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect'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 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 perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 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 shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

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§ 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 is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is 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 Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been 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 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 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

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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

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.

§ 3.14 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 or separate 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 or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor 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 may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner 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 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 or Architect. 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.

§ 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

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§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 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 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The 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. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 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 (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 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 Architect about matters arising out of or relating to the Contract. 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 separate contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

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§ 4.2.7 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. Review of such submittals 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 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 Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the 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.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 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.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 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 rendered in good faith.

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

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests 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 a separate contractor or subcontractors of a separate contractor.

§ 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.

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§ 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 Owner through the 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 Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the 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 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 or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner 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 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 the responsibility for safety of the Subcontractor's Work, which the Contractor by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner 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

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Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate 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 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 Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.1.4 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 and separate 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 or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the 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 or separate contractor's 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 that are payable to a separate contractor 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 a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 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 or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors 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 Architect will allocate the cost among those responsible.

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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, Contractor and Architect; a Construction Change Directive requires agreement by the Owner 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

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect 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 Architect and signed by the Owner 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 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 Architect 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

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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 Architect 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 Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's 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 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 Architect will 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 signed by the Architect 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.

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§ 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 or Architect, or of an employee of either, or of a separate contractor employed by the Owner; 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 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 Architect, 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 Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect 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 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 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

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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 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations 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 Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed 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 Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from 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 withholds certification for payment under Section 9.5.1.3, 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 Architect 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, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

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§ 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 Architect 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 Architect and Owner 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 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 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 Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after 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 Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner 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 that 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 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 Contractor's list, the Architect 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 Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

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§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare 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 shall 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.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, 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 receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's 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 Architect's final 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 (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.

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§ 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 Architect so confirms, the Owner shall, upon application by the Contractor and certification by the 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 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.

§ 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; and
.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.

§ 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 and 10.2.1.3 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 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either 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.

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§ 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 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 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 the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor 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 and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased 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, Architect, 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 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.

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§ 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 that 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;
- .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 filed with the Owner 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 on account of revised limits or claims paid under the General Aggregate, or both, 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 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.

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§ 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 Architect's and Contractor'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, 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, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment

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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 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 they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, 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, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions 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.

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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 Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the 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 separate contractor 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 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 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 for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 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 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.

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§ 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 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, 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 there under, 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 Architect timely notice of when and where tests and inspections are to be made so that the 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 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 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 Architect of when and where tests and inspections are to be made so that the 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

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such failure including those of repeated procedures and compensation for the 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 Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 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 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 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 Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, 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 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 and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

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§ 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, 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 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 be certified by the Initial Decision Maker, upon application, 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 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 the 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.

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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 Architect, if the 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 Architect will prepare Change Orders and issue Certificates 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 10.4.

§ 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.

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§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of 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, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of 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.

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§ 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.

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SECTION 00 73 13

SUPPLEMENTARY GENERAL CONDITIONS A201-2007

The following supplements modify the "General Conditions of the Contract for Construction," AIA Document A201-2007. 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.

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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

7. CHANGES IN THE WORK

8. TIME

9. PAYMENTS AND COMPLETION

10. PROTECTION OF PERSONS AND PROPERTY

11. INSURANCE AND BONDS

12. UNCOVERING AND CORRECTION OF WORK

13. MISCELLANEOUS PROVISIONS

14. TERMINATION OR SUSPENSION OF THE CONTRACT

ARTICLE 1: GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

Delete the last sentence in its entirety and replace with the following:

"The Contract Documents also include Advertisement for Bid, Instructions to Bidder, sample forms, the Bid Form, the Contractor's completed Bid and the Award Letter."

Add the following Paragraph:

1.1.2 In the event of conflict or discrepancies among the Contract Documents, the Documents prepared by the State of Delaware, Division of Facilities Management shall take precedence over all other documents.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following Paragraphs:

1.2.4 In the case of an inconsistency between the Drawings and the Specifications, or within either document not clarified by addendum, the better quality or greater quantity of work shall be provided in accordance with the Architect's interpretation.

1.2.5 The word "PROVIDE" as used in the Contract Documents shall mean "FURNISH AND INSTALL" and shall include, without limitation, all labor, materials, equipment, transportation, services and other items required to complete the Work.

1.2.6 The word "PRODUCT" as used in the Contract Documents means all materials, systems and equipment.

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

Delete Paragraph 1.5.1 in its entirety and replace with the following:

"All pre-design studies, drawings, specifications and other documents, including those in electronic form, prepared by the Architect under this Agreement are, and shall remain, the property of the Owner whether the Project for which they are made is executed or not. 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.

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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. Prior to re-use of construction documents for a Project in which the Architect is not also involved, the Owner will remove from such documents all identification of the original Architect, including name, address and professional seal or stamp."

Delete Paragraph 1.5.2 in its entirety.

ARTICLE 2: OWNER

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

To Subparagraph 2.2.3 – Add the following sentence:

"The Contractor, at their expense shall bear the costs to accurately identify the location of all underground utilities in the area of their excavation and shall bear all cost for any repairs required, out of failure to accurately identify said utilities."

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 three (3) sets of the Drawings and Project Manuals. Additional sets will be furnished at the cost of reproduction, postage and handling.

ARTICLE 3: CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

Amend Paragraph 3.2.2 to state that any errors, inconsistencies or omissions discovered shall be reported to the Architect and Owner immediately.

Delete the third sentence in Paragraph 3.2.3.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

Add the following Paragraphs:

3.3.2.1 The Contractor shall immediately remove from the Work, whenever requested to do so by the Owner, any person who is considered by the Owner or Architect to be incompetent or disposed to be so 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.

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3.3.5 When any room is used as a shop, storeroom, office, etc., by the Contractor or Subcontractor(s) during the construction of the Work, the Contractor making use of these areas will be held responsible for any repairs, patching or cleaning arising from such use.

3.4 LABOR AND MATERIALS

Add the Following Paragraphs:

3.4.4 Before starting the Work, each Contractor shall carefully examine all preparatory Work that has been executed to receive their Work. Check carefully, by whatever means are required, to insure that its Work and adjacent, related Work, will finish to proper contours, planes and levels. Promptly notify the General Contractor/Construction Manager of any defects or imperfections in preparatory Work which will in any way affect satisfactory completion of its Work. Absence of such notification will be construed as an acceptance of preparatory Work and later claims of defects will not be recognized.

3.4.5 Under no circumstances shall the Contractor's Work proceed prior to preparatory Work having been completely cured, dried and/or otherwise made satisfactory to receive this Work. Responsibility for timely installation of all materials rests solely with the Contractor responsible for that Work, who shall maintain coordination at all times.

3.5 WARRANTY

Add the following Paragraphs:

3.5.1 The Contractor will guarantee all materials and workmanship against original defects, except injury from proper and usual wear when used for the purpose intended, for two (2) years after Acceptance by the Owner, and will maintain all items in perfect condition during the period of guarantee.

3.5.2 Defects appearing during the period of guarantee will be made good by the Contractor at his expense upon demand of the Owner, it being required that all work will be in perfect condition when the period of guarantee will have elapsed.

3.5.3 In addition to the General Guarantee there are other guarantees required for certain items for different periods of time than the two (2) years as above, and are particularly so stated in that part of the specifications referring to same. The said guarantees will commence at the same time as the General Guarantee.

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.

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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 (1) complete set to each of the Operating and Maintenance Instructions/Manuals.

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

ARTICLE 4: ADMINISTRATION OF THE CONTRACT

4.2 ADMINISTRATION OF THE CONTRACT

Delete the first sentence of Paragraph 4.2.7 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 4.2.7 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 Paragraph:

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

Add to Paragraph 4.2.13 "and in compliance with all local requirements." to the end of the sentence

ARTICLE 5: SUBCONTRACTORS

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

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Delete Paragraph 5.2.3 in its entirety and replace with the following:

5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection, subject to the statutory requirements of 29 Delaware Code § 6962(d)(10)b.3 and 4.

ARTICLE 6: CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

Delete Paragraph 6.1.4 in its entirety.

6.2 MUTUAL RESPONSIBILITY

6.2.3 In the second sentence, strike the word "shall" and insert the word "may".

ARTICLE 7: CHANGES IN THE WORK

(SEE ARTICLE 7: CHANGES IN WORK IN THE GENERAL REQUIREMENTS)

ARTICLE 8: TIME

8.2 PROGRESS AND COMPLETION

Add the following Paragraphs:

8.2.1.1 Refer to Specification Section 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.

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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 their rights under the Contract.

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 and Continuation Sheet to G703.

9.2.2 The Schedule of Values is to include a line item for Project Closeout Document Submittal. The value of this item is to be no less than 1% of the initial contract amount.

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:

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;

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.10 failure to comply with mandatory requirements for maintaining Record Documents.

9.6 PROGRESS PAYMENTS

Delete Paragraph 9.6.1 in its entirety and replace with the following:

9.6.1 After the Architect has 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.

9.7 FAILURE OF PAYMENT

In first sentence, strike "seven" and insert "thirty (30)". Also strike "binding dispute resolution" and insert "remedies at law or in equity".

9.8 SUBSTANTIAL COMPLETION

To Subparagraph 9.8.3- Add the following sentence:

"If the Architect is required to make more than 2 inspections of the same portion of work, the Contractor shall be responsible for all costs associated with subsequent inspections including but not limited to any Architect's fees."

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:

10.1.1.1 Each Contractor shall develop a safety program in accordance with the Occupational Safety and Health Act of 1970. A copy of said plan shall be furnished to the Owner and Architect prior to the commencement of that Contractor's Work.

10.1.2 Each Contractor shall appoint a Safety Representative. Safety Representatives shall be someone who is on site on a full time basis. If deemed necessary by the Owner or Architect, Contractor Safety meetings will be scheduled. The attendance of all Safety Representatives will be required. Minutes will be recorded of said meetings by the Contractor and will be distributed to all parties as well as posted in all job offices/trailers etc.

10.2 SAFETY OF PERSONS AND PROPERTY

Add the following Paragraph:

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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.

10.3 HAZARDOUS MATERIALS

Delete Paragraph 10.3.3 in its entirety.

10.5 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."

11.2 OWNER'S LIABILITY INSURANCE

Delete Paragraph 11.2 in its entirety.

11.3 PROPERTY INSURANCE

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

11.3 The State 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

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

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

12.2.2 AFTER SUBSTANTIAL COMPLETION
Add the following Paragraph:

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12.2.2.1.1 At any time during the progress of the Work, or in any case where the nature of the defects will be such that it is not expedient to have corrected, the Owner, at its option, will have the right to deduct such sum, or sums, of money from the amount of the Contract as it considers justified to adjust the difference in value between the defective work and that required under contract including any damage to the structure.

12.2.2.1 Strike "one" and insert "two".

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."

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.

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 and Owner immediately upon discovery.

ARTICLE 14: TERMINATION OR SUSPENSION OF THE CONTRACT

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

Delete Paragraph 14.4.3 in its entirety and replace with the following:

14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and cost incurred by reason of such termination along with reasonable overhead.

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ARTICLE 15: CLAIMS AND DISPUTES

15.1.2 Throughout the Paragraph strike “21” and insert “45”.

15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

Delete Paragraph 15.1.6 in its 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,” Strike “binding dispute resolution” and insert “remedies at law and in equity”.

15.4 ARBITRATION

Delete Paragraph 15.4 and its sub-sections in its entirety.

END OF SECTION

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SECTION 00 73 14

ADDITIONAL SUPPLEMENTAL GENERAL CONDITIONS

PART 1 GENERAL

1.01 GENERAL CONDITIONS

A. The General Conditions of the Contract for Construction, AIA Document A201, 1997 edition, Articles 1 through 14 inclusive, is part of this contract and is bound herewith.

B. Reference to Articles herein are to AIA Document A201.

1.02 SUPPLEMENTARY CONDITIONS

A. The following provisions modify, change, delete from or add to AIA Document A201. Where any article of the General Conditions is modified or any paragraph, subparagraph or clause thereof is modified or deleted by these provisions, the unaltered provisions of that article, paragraph, sub-paragraph or clause shall remain in effect.

1.03 REFERENCE TO DIVISION 1 - GENERAL REQUIREMENTS

A. Certain provisions of Division 1, GENERAL REQUIREMENTS supplement the administrative and work-related provisions of the GENERAL CONDITIONS.

B. Articles affected are cross referenced in the various sections of Division 1.

C. Throughout the entire document, wherever "Architect" is stated, read "Engineer".

1.04 ARTICLE 1 - CONTRACT DOCUMENTS

A. Paragraph 1.1 - Basic Definitions

Add the following subparagraph:

1.1.8 Terms and Definitions

The following definitions apply to the terms listed below as used on the Drawings and in the Project Manual.

Approved: Accepted by the Engineer or authority enforcing standards.

Described: Refer to Project Manual.

Specified: Refer to Project Manual.

Shown: Refer to Drawings.

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1.05 ARTICLE 3 - CONTRACTOR

A. Paragraph 3.4 - Labor and Materials

Subparagraph 3.4.1 - Add the following sentence:

Refer to Division 1 for detailed requirements concerning Temporary Facilities and Equipment.

Subparagraph 3.4.2 - Add the following sentence:

Refer specifically to Division 1 for detailed procedures regarding substitutions of material and/or equipment.

B. Paragraph 3.7 - Permits, Fees and Notices

Add the following:

3.7.5 Where local law at the site of the building requires a Certificate of Occupancy, the Contractor shall obtain and pay for this Certificate and deliver it to the Owner.

1.06 ARTICLE 5 - SUBCONTRACTORS

A. Paragraph 5.2 - Award of Subcontracts and Other Contracts for Portions of the Work.

Add the following subparagraphs:

5.2.6 For Public Works Contracts, the Contractor shall not subcontract, sublet, sell, or transfer work or materials to an organization other than their own without written permission from the State. In case such permission is given, the Contractor will be permitted to subcontract or sublet a portion thereof but shall perform with their own organization work amounting to not less than ten percent (10%) of the total contract bid price, exclusive of General Condition Items, Overhead, and Profit.

1.07 ARTICLE 8 - TIME

A. Paragraph 8.1.2

Add the following:

The Contractor shall begin work within ten (10) days following receipt of an Official Purchase Order issued by the State of Delaware.

1.08 ARTICLE 11 - INSURANCE

A. Paragraph 11.5 - Performance Bond and Payment Bond

Add the following subparagraphs:

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11.5.3 Prior to delivery of the executed contract, the Contractor must deliver to the Owner an executed performance bond in the amount of 100% of the accepted bid as security for the faithful performance of their contract and include the one year guarantee; and an executed labor and material payment bond in the amount of 100% of the accepted bid as security for the payment of all persons performing labor or furnishing materials in connection therewith and conditioned that the Contractor shall well and faithfully pay all daily labor employed by their firm for this contract in full once each week. Performance and payment bond may be in a combined form. The bonding company's standard forms are acceptable provided all coverage requirements are included. Consent of Surety must be included.

11.5.4 Bonds are to be in favor of the Owner and shall be paid for by the Contractor and furnished by a surety company licensed in the State of Delaware. The Owner has the right to demand proof that the parties signing the bonds are duly authorized to do so.

1.09 ARTICLE 15 - PREFERENCE FOR DELAWARE LABOR

A. 15.1 The Contractor shall comply with the following provisions of **Delaware Code**, Title 29, Chapter 69, Section 6962:

In the construction of all public works for the State or any political subdivision or by persons contracting with the State or any political subdivision thereof, preference in employment of laborers, workmen or mechanics, shall be given to bona-fide legal citizens of the State who have established citizenship by residence of at least 90 days in the State. Each Public works contract for the construction of public works for the State or any political subdivision thereof shall contain a stipulation that any person, company, or corporation who violates this Section shall pay a penalty to the Secretary of Finance equal to the amount of compensation paid to any person in violation of this section.

15.2 **Preference for Delaware Labor:** Surety bonds in the amount of 6% of the contract or subcontract price are required for all non-resident contractors for contracts within the State of Delaware in which either:

1. The single contract or subcontract totals $20,000 or more; <u>or</u>

2. The contract or sub-contract is a “cost-plus” contract whose estimated cost - and - profit totals $20,000 or more; <u>or</u>

3. The aggregate of two or more contracts or subcontracts in a calendar year totals $20,000 or more.

The Division of Revenue will accept cash bonds, which may be paid by check on contracts not exceeding $100,000.

The Contractor's bond shall be filed before construction commences on any contract upon which a bond is required, pursuant to Title 30 **Delaware Code** Chapter 375 as outlined above.

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For licensing requirements, penalties, definitions, information filing and other requirements, bidders shall refer to Technical Information Memorandum 86-10 and Code Sections 375, 2501 and 2503. For additional information, contact 1-800-292-7826.

1.10 ARTICLE 16 - LICENSE, TAX AND STATE LAW REQUIREMENTS

A. 16.1 In the performance of this Contract the successful bidder is required to comply with all applicable Federal, State and Local laws, ordinances, codes and regulations. The cost of permits, insurance, taxes and other relevant costs required in the performance of the Contract shall be borne by the successful bidder. All Delaware Laws in reference to construction shall be as binding as though quoted in full herein and their application shall be fully adhered to by all parties affected hereby. The Contractor shall furnish upon request any or all of the referenced items.

B. 16.2 All bidders shall be properly licensed and authorized to transact business in the State of Delaware as provided for in the Delaware Code Title 30, Chapter §2502 and in any and all Delaware Municipalities having jurisdiction to require such licensing within the geographic boundaries of the site (s) where the work is to be performed prior to the execution of any contract resulting from this bid. In the case of contracts in excess of $50,000.00 which are competitively bid, such person shall have initiated the license application procedure required by this subsection with the Division of Revenue prior to, or in conjunction with the submission of a bid on a contract, or in the case of a subcontractor, prior to the submission of a bid by the general contractor. Proof of such a license compliance shall be as determined by the Owner or their designee.

C. 16.3 All bidders for public works projects shall insure that they have met all general contractor and/or subcontractor licensing requirements in accord with the requirement of Title 29 Chapter 6962 prior to submitting a bid.

1.11 ARTICLE 19 - INDEMNIFICATION BY THE CONTRACTOR AND SUBCONTRACTORS

A. 19.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, the Architect, the Consulting Engineers and their agents and employees from and against all claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself including the loss of use resulting therefrom, and (2) is caused in whole or in part by an negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in the INDEMNIFICATION BY CONTRACTOR Article.

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19.1.2 In any and all claims against the Owner, the Architect, and Consulting Engineers or any of their agents or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or Subcontractor under workers' or workmen's compensation acts, disability benefits acts or other employee benefit acts.

19.1.3.4 The obligations of the Contractor shall not extend to the liability of the Architect, the Consulting Engineers or their agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, design or specifications or (2) the giving or the failure to give directions or instructions by the Architect, the Consulting Engineers or their agents or employees provided such giving or failure to give is the primary cause of the injury or damage.

19.2 **INDEMNIFICATION BY THE SUBCONTRACTORS**

19.2.1 Contractor hereby covenants and agrees that it will include the following provisions in all subcontracts entered into by the contractor for performance of any and all portions of the work on the project:

(1) To the fullest extent permitted by law, the Subcontractor shall indemnify and hold harmless the Owner, the Architect, the Consulting Engineers and their agents and employees from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting therefrom, and (2) is caused in whole or in part by any negligent act or omission of the Subcontractor may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation or indemnity which would otherwise exist as to any party or person described in the INDEMNIFICATION BY THE SUBCONTRACTORS Article.

a. In any and all claims against the Owner, the Architect, the Consulting Engineers or any of their agents or employees by any employee of the Subcontractor, anyone directly or indirectly employed by the Subcontractor or anyone for whose acts the Subcontractor may be liable, the indemnification obligation under this Article shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or the Subcontractor under workers' or workmen's

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compensation acts, disability benefits acts or other employee benefit acts.

b. The obligation of the Subcontractor under this Article shall not extend to the liability of the Architect, the Consulting Engineers, their agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, design or specifications, or (2) the giving of or the failure to give direction of instructions by the Architect, the Consulting Engineers, their agents or employees provided such giving or failure to give is the primary cause of the injury or damage.

END OF SECTION

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SECTION 00 81 13
GENERAL REQUIREMENTS

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12. UNCOVERING AND CORRECTION OF WORK

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ARTICLE 1: GENERAL

1.1 CONTRACT DOCUMENTS

1.1.1 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 to an extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results.

1.1.2 Work including material purchases shall not begin until the Contractor is in receipt of a bonafide State of Delaware Purchase Order. Any work performed or material purchases prior to the issuance of the Purchase Order is done at the Contractor's own risk and cost.

1.2 EQUALITY OF EMPLOYMENT OPPORTUNITY ON PUBLIC WORKS

1.2.1 For Public Works Projects financed in whole or in part by state appropriation the Contractor agrees that during the performance of this contract:

1. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, sex, color, sexual orientation, gender identity or national origin. The Contractor will take positive steps to ensure that 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.

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

ARTICLE 2: OWNER

(NO ADDITIONAL GENERAL REQUIREMENTS – SEE SUPPLEMENTARY GENERAL CONDITIONS)

ARTICLE 3: CONTRACTOR

3.1 Schedule of Values: The successful Bidder shall within twenty (20) days after receiving notice to proceed with the work, furnish to the Owner a complete schedule of values on the various items comprising the work.

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3.2 Subcontracts: Upon approval of Subcontractors, the Contractor shall award their Subcontracts as soon as possible after the signing of their own contract and see that all material, their own and those of their Subcontractors, are promptly ordered so that the work will not be delayed by failure of materials to arrive on time.

3.3 Before commencing any work or construction, the General Contractor is to consult with the Owner as to matters in connection with access to the site and the allocation of Ground Areas for the various features of hauling, storage, etc.

3.4 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 instructions.

3.5 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

3.6 The Contractor warrants to the Owner that materials and equipment furnished will be new and of good quality, unless otherwise permitted, and that the work will be free from defects and in conformance with the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved, may be considered defective. If required by the Owner, the Contractor shall furnish evidence as to the kind and quality of materials and equipment provided.

3.7 Unless otherwise provided, the Contractor shall pay all sales, consumer, use and other similar taxes, and shall secure and pay for required permits, fees, licenses, and inspections necessary for proper execution of the Work.

3.8 The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on performance of the Work. The Contractor shall promptly notify the Owner if the Drawings and Specifications are observed to be at variance therewith.

3.9 The Contractor shall be responsible to the Owner for the acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons performing portions of the Work under contract with the Contractor.

3.10 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 from and about the Project all waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials. The Contractor shall be responsible for returning all damaged areas to their original conditions.

3.11 STATE LICENSE AND TAX REQUIREMENTS

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3.11.1 Each 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 Delaware Department of Finance within ten (10) days after entering into any contract with a contractor or subcontractor not a resident of this State, a statement of total value of such contract or contracts together with the names and addresses of the contracting parties."

3.12. The Contractor shall comply with all requirements set forth in Section 6962, Chapter 69, Title 29 of the Delaware Code.

3.13 During the contract Work, the Contractor and each listed Subcontractor, shall implement an Employee Drug Testing Program in accordance with OMB Regulation 4104- "Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on "Large Public Works Projects". "Large Public Works" is based upon the current threshold required for bidding Public Works as set by the Purchasing and Contracting Advisory Council.

ARTICLE 4: ADMINISTRATION OF THE CONTRACT

4.1 CONTRACT SURETY

4.1.1 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

4.1.2 All bonds will be required as follows unless specifically waived elsewhere in the Bidding Documents.

4.1.3 Contents of Performance Bonds – The bond shall be in the form approved by the Office of Management and Budget. The bond shall be conditioned upon the faithful compliance and performance by the successful bidder of each and every term and condition of the contract and the proposal, plans, specifications, and bid documents thereof. Each term and condition shall be met at the time and in the manner prescribed by the Contract, Bid documents and the specifications, including the payment in full to every person furnishing materiel or performing labor in the performance of the Contract, of all sums of money due the person for such labor and materiel. (The bond shall also contain the successful bidder's guarantee to indemnify and save harmless the State and the agency from all costs, damages and expenses growing out of or by reason of the Contract in accordance with the Contract.)

4.1.4 Invoking a Performance Bond – The agency may, when it considers that the interest of the State so require, cause judgement to be confessed upon the bond.

4.1.5 Within twenty (20) days after the date of notice of award of contract, the Bidder to whom the award is made shall furnish a Performance Bond and Labor and Material Payment Bond, each equal to the full amount of the Contract price to guarantee the faithful performance of all terms, covenants and conditions of the same. The bonds are to be issued by an acceptable Bonding Company licensed to do business in the State of Delaware and shall be issued in duplicate.

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4.1.6 Performance and Payment Bonds shall be maintained in full force (warranty bond) for a period of two (2) years after the date of the Certificate for Final Payment. The Performance Bond shall guarantee the satisfactory completion of the Project and that the Contractor will make good any faults or defects in his work which may develop during the period of said guarantees as a result of improper or defective workmanship, material or apparatus, whether furnished by themselves or their Sub-Contractors. The Payment Bond shall guarantee that the Contractor shall pay in full all persons, firms or corporations who furnish labor or material or both labor and material for, or on account of, the work included herein. The bonds shall be paid for by this Contractor. The Owner shall have the right to demand that the proof parties signing the bonds are duly authorized to do so.

4.2 FAILURE TO COMPLY WITH CONTRACT

4.2.1 If any firm entering into a contract with the State, or Agency that neglects or refuses to perform or fails to comply with the terms thereof, the Agency which signed the Contract may terminate the Contract and proceed to award a new contract in accordance with this Chapter 69, Title 29 of the Delaware Code or may require the Surety on the Performance Bond to complete the Contract in accordance with the terms of the Performance Bond. Nothing herein shall preclude the Agency from pursing additional remedies as otherwise provided by law.

4.3 CONTRACT INSURANCE AND CONTRACT LIABILITY

4.3.1 In addition to the bond requirements stated in the Bid Documents, each successful Bidder shall purchase adequate insurance for the performance of the Contract and, by submission of a Bid, agrees to indemnify and save harmless and to defend all legal or equitable actions brought against the State, any Agency, officer and/or employee of the State, for and from all claims or liability which is or may be the result of the successful Bidder's actions during the performance of the Contract.

4.3.2 The purchase or non-purchase of such insurance or the involvement of the successful Bidder in any legal or equitable defense of any action brought against the successful Bidder based upon work performed pursuant to the Contract will not waive any defense which the State, its agencies and their respective officers, employees and agents might otherwise have against such claims, specifically including the defense of sovereign immunity, where applicable, and by the terms of this section, the State and all agencies, officers and employees thereof shall not be financially responsible for the consequences of work performed, pursuant to said contract.

4.4 RIGHT TO AUDIT RECORDS

4.4.1 The Owner 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.

4.4.2 Said books and records shall be maintained by the Contractor for a period of seven (7) years from the date of final payment under the Prime Contract and by the Subcontractor for a period of seven (7) years from the date of final payment under the Subcontract.

ARTICLE 5: SUBCONTRACTORS

NOT FOR BIDDING PURPOSES

5.1 SUBCONTRACTING REQUIREMENTS

5.1.1 All contracts for the construction, reconstruction, alteration or repair of any public building (not a road, street or highway) shall be subject to the following provisions:

1. A contract shall be awarded only to a Bidder whose Bid is accompanied by a statement containing, for each Subcontractor category, the name and address (city or town and State only – street number and P.O. Box addresses not required) of the subcontractor whose services the Bidder intends to use in performing the Work and providing the material for such Subcontractor category.

2. A Bid will not be accepted nor will an award of any Contract be made to any Bidder which, as the Prime Contractor, has listed itself as the Subcontractor for any Subcontractor unless:

   A. It has been established to the satisfaction of the awarding Agency that the Bidder has customarily performed the specialty work of such Subcontractor category by artisans regularly employed by the Bidder's firm;

   B. That the Bidder is duly licensed by the State to engage in such specialty work, if the State requires licenses; and

   C. That the Bidder is recognized in the industry as a bona fide Subcontractor or Contractor in such specialty work and Subcontractor category.

5.1.2 The decision of the awarding Agency as to whether a Bidder who list itself as the Subcontractor for a Subcontractor category shall be final and binding upon all Bidders, and no action of any nature shall lie against any awarding agency or its employees or officers because of its decision in this regard.

5.1.3 After such a Contract has been awarded, the successful Bidder shall not substitute another Subcontractor for any Subcontractor whose name was set forth in the statement which accompanied the Bid without the written consent of the awarding Agency.

5.1.4 No Agency shall consent to any substitution of Subcontractors unless the Agency is satisfied that the Subcontractor whose name is on the Bidders accompanying statement:

A. Is unqualified to perform the work required;

B. Has failed to execute a timely reasonable Subcontract;

C. Has defaulted in the performance on the portion of the work covered by the Subcontract; or

D. Is no longer engaged in such business.

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5.1.5 Should a Bidder be awarded a contract, such successful Bidder shall provide to the agency the taxpayer identification license numbers of such subcontractors. Such numbers shall be provided on the later of the date on which such subcontractor is required to be identified or the time the contract is executed. The successful Bidder shall provide to the agency to which it is contracting, within 30 days of entering into such public works contract, copies of all Delaware Business licenses of subcontractors and/or independent contractors that will perform work for such public works contract. However, if a subcontractor or independent contractor is hired or contracted more than 20 days after the Bidder entered the public works contract the Delaware Business license of such subcontractor or independent contractor shall be provided to the agency within 10 days of being contracted or hired.

5.2 PENALTY FOR SUBSTITUTION OF SUBCONTRACTORS

5.2.1 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 payments 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 contract amount not to exceed $10,000

5.3 ASBESTOS ABATEMENT

5.3.1 The selection of any Contractor to perform asbestos abatement for State-funded projects shall be approved by the Office of Management and Budget, Division of Facilities Management pursuant to Chapter 78 of Title 16.

5.4 STANDARDS OF CONSTRUCTION FOR THE PROTECTION OF THE PHYSICALLY HANDICAPPED

5.4.1 All Contracts shall conform with the standard established by the Delaware Architectural Accessibility Board unless otherwise exempted by the Board.

5.5 CONTRACT PERFORMANCE

5.5.1 Any firm entering into a Public Works Contract that neglects or refuses to perform or fails to comply with its terms, the Agency may terminate the Contract and proceed to

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award a new Contract or may require the Surety on the Performance Bond to complete the Contract in accordance with the terms of the Performance Bond.

ARTICLE 6: CONSTRUCTION BY OWNER OR SEPARATE CONTRACTORS

6.1 The Owner reserves the right to simultaneously perform other construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other Projects at the same site.

6.2 The Contractor shall afford the Owner and other Contractors reasonable opportunity for access and storage of materials and equipment, and for the performance of their activities, and shall connect and coordinate their activities with other forces as required by the Contract Documents.

ARTICLE 7: CHANGES IN THE WORK

7.1 The Owner, without invalidating the Contract, may order changes in the Work consisting of Additions, Deletions, Modifications or Substitutions, with the Contract Sum and Contract completion date being adjusted accordingly. Such changes in the Work shall be authorized by written Change Order signed by the Professional as the duly authorized agent, the Contractor and the Owner.

7.2 The Contract Sum and Contract Completion Date shall be adjusted only by a fully executed Change Order.

7.3 The additional cost, or credit to the Owner resulting from a change in the Work shall be by mutual agreement of the Owner, Contractor and the Architect. In all cases, this cost or credit shall be based on the 'DPE' wages required and the "invoice price" of the materials/equipment needed.

7.3.1 "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, Social Security/Medicare, and unemployment insurance (a maximum multiplier of 1.35 times DPE).

7.3.2 "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. Rates for equipment that is leased and/or owned by the Contractor or subcontractor(s) shall not exceed those listed in the latest version of the "Means Building Construction Cost Data" publication.

7.3.3 In addition to the above, the General Contractor is allowed a fifteen percent (15%) markup for overhead and profit for additional work performed by the General Contractor's own forces. For additional subcontractor work, the Subcontractor is allowed a fifteen (15) percent overhead and profit on change order work above and beyond the direct costs stated previously. To this amount, the General Contractor will be allowed a mark-up not exceeding seven and one half percent (7.5%) on the subcontractors work. These mark-ups shall include all costs including, but not limited

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to: overhead, profit, bonds, insurance, supervision, etc. No markup is permitted on the work of the subcontractors subcontractor. No additional costs shall be allowed for changes related to the Contractor's onsite superintendent/staff, or project manager, unless a change in the work changes the project duration and is identified by the CPM schedule. There will be no other costs associated with the change order.

ARTICLE 8: TIME

8.1 Time limits, if any, are as stated in the Project Manual. By executing the Agreement, the Contractor confirms that the stipulated limits are reasonable, and that the Work will be completed within the anticipated time frame.

8.2 If progress of the Work is delayed at any time by changes ordered by the Owner, by labor disputes, fire, unusual delay in deliveries, abnormal adverse weather conditions, unavoidable casualties or other causes beyond the Contractor's control, the Contract Time shall be extended for such reasonable time as the Owner may determine.

8.3 Any extension of time beyond the date fixed for completion of the construction and acceptance of any part of the Work called for by the Contract, or the occupancy of the building by the Owner, in whole or in part, previous to the completion shall not be deemed a waiver by the Owner of his right to annul or terminate the Contract for abandonment or delay in the matter provided for, nor relieve the Contractor of full responsibility.

8.4 SUSPENSION AND DEBARMENT

8.4.1 Per Section 6962(d)(14), Title 29, Delaware Code, "Any Contractor who fails to perform a public works contract or complete a public works project within the time schedule established by the Agency in the Invitation To Bid, may be subject to Suspension or Debarment for one or more of the following reasons: a) failure to supply the adequate labor supply ratio for the project; b) inadequate financial resources; or, c) poor performance on the Project."

8.4.2 "Upon such failure for any of the above stated reasons, the Agency that contracted for the public works project may petition the Director of the Office of Management and Budget for Suspension or Debarment of the Contractor. The Agency shall send a copy of the petition to the Contractor within three (3) working days of filing with the Director. If the Director concludes that the petition has merit, the Director shall schedule and hold a hearing to determine whether to suspend the Contractor, debar the Contractor or deny the petition. The Agency shall have the burden of proving, by a preponderance of the evidence, that the Contractor failed to perform or complete the public works project within the time schedule established by the Agency and failed to do so for one or more of the following reasons: a) failure to supply the adequate labor supply ratio for the project; b) inadequate financial resources; or, c) poor performance on the project. Upon a finding in favor of the Agency, the Director may suspend a Contractor from Bidding on any project funded, in whole or in part, with public funds for up to 1 year for a first offense, up to 3 years for a second offense and permanently debar the Contractor for a third offense. The Director shall issue a written decision and shall send a copy to the Contractor and the Agency. Such decision may be appealed to the Superior Court within thirty (30) days for a review on the record."

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8.5 RETAINAGE

8.5.1 Per Section 6962(d)(5) a.3, Title 29, Delaware Code: The Agency may at the beginning of each public works project establish a time schedule for the completion of the project. If the project is delayed beyond the completion date due to the Contractor's failure to meet their responsibilities, the Agency may forfeit, at its discretion, all or part of the Contractor's retainage.

8.5.2 This forfeiture of retainage also applies to the timely completion of the punchlist. A punchlist will only be prepared upon the mutual agreement of the Owner, Architect and Contractor. Once the punchlist is prepared, all three parties will by mutual agreement, establish a schedule for its completion. Should completion of the punchlist be delayed beyond the established date due to the Contractor's failure to meet their responsibilities, the Agency may hold permanently, at its discretion, all or part of the Contractor's retainage.

ARTICLE 9: PAYMENTS AND COMPLETION

9.1 APPLICATION FOR PAYMENT

9.1.1 Applications for payment shall be made upon AIA Document G702. There will be a five percent (5%) retainage on all Contractor's monthly invoices until completion of the project. This retainage may become payable upon receipt of all required closeout documentation, provided all other requirements of the Contract Documents have been met.

9.1.2 A date will be fixed for the taking of the monthly account of work done. Upon receipt of Contractor's itemized application for payment, such application will be audited, modified, if found necessary, and approved for the amount. Statement shall be submitted to the Owner.

9.1.3 Section 6516, Title 29 of the Delaware Code annualized interest is not to exceed 12% per annum beginning thirty (30) days after the "presentment" (as opposed to the date) of the invoice.

9.2 PARTIAL PAYMENTS

9.2.1 Any public works Contract executed by any Agency may provide for partial payments at the option of the Owner with respect to materials placed along or upon the sites or stored at secured locations, which are suitable for use in the performance of the contract.

9.2.2 When approved by the agency, partial payment may include the values of tested and acceptable materials of a nonperishable or noncontaminative nature which have been produced or furnished for incorporation as a permanent part of the work yet to be completed, provided acceptable provisions have been made for storage.

9.2.2.1 Any allowance made for materials on hand will not exceed the delivered cost of the materials as verified by invoices furnished by the Contractor, nor will it exceed the contract bid price for the material complete in place.

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9.2.3 If requested by the Agency, receipted bills from all Contractors, Subcontractors, and material, men, etc., for the previous payment must accompany each application for payment. Following such a request, no payment will be made until these receipted bills have been received by the Owner.

9.3 SUBSTANTIAL COMPLETION

9.3.1 When the building has been made suitable for occupancy, but still requires small items of miscellaneous work, the Owner will determine the date when the project has been substantially completed.

9.3.2 If, after the Work has been substantially completed, full completion thereof is materially delayed through no fault of the Contractor, and without terminating the Contract, the Owner may make payment of the balance due for the portion of the Work fully completed and accepted. Such payment shall be made under the terms and conditions governing final payment that it shall not constitute a waiver of claims.

9.3.3 On projects where commissioning is included, the commissioning work as defined in the specifications must be complete prior to the issuance of substantial completion.

9.4 FINAL PAYMENT

9.4.1 Final payment, including the five percent (5%) retainage if determined appropriate, shall be made within thirty (30) days after the Work is fully completed and the Contract fully performed and provided that the Contractor has submitted the following closeout documentation (in addition to any other documentation required elsewhere in the Contract Documents):

9.4.1.1 Evidence satisfactory to the Owner that all payrolls, material bills, and other indebtedness connected with the work have been paid,

9.4.1.2 An acceptable RELEASE OF LIENS,

9.4.1.3 Copies of all applicable warranties,

9.4.1.4 As-built drawings,

9.4.1.5 Operations and Maintenance Manuals,

9.4.1.6 Instruction Manuals,

9.4.1.7 Consent of Surety to final payment.

9.4.1.8 The Owner reserves the right to retain payments, or parts thereof, for its protection until the foregoing conditions have been complied with, defective work corrected and all unsatisfactory conditions remedied.

ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY

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10.1 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 take all reasonable precautions to prevent damage, injury or loss to: workers, persons nearby who may be affected, the Work, materials and equipment to be incorporated, and existing property at the site or adjacent thereto. The Contractor shall give notices and comply with applicable laws ordinances, rules regulations, and lawful orders of public authorities bearing on the safety of persons and property and their protection from injury, damage, or loss. The Contractor shall promptly remedy damage and loss to property at the site caused in whole or in part by the Contractor, a Subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable.

10.2 The Contractor shall notify the Owner in the event any existing hazardous material such as lead, PCBs, asbestos, etc. is encountered on the project. The Owner will arrange with a qualified specialist for the identification, testing, removal, handling and protection against exposure or environmental pollution, to comply with applicable regulation laws and ordinances. The Contractor and Architect will not be required to participate in or to perform this operation. Upon completion of this work, the Owner will notify the Contractor and Architect in writing the area has been cleared and approved by the authorities in order for the work to proceed. The Contractor shall attach documentation from the authorities of said approval.

10.3 As required in the Hazardous Chemical Information Act of June 1984, all vendors supplying any materials 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 warning caution on the label relating to a potential physical or health hazard, if it is known to be present in the workplace, and if employees may be exposed under normal conditions or in any foreseeable emergency situation. Material Safety Data Sheets <u>must</u> be provided <u>directly to the Owner</u> along with the shipping slips that include those products.

10.4 The Contractor shall certify to the Owner that materials incorporated into the Work are free of all asbestos. This certification may be in the form of Material Safety Data Sheet (MSDS) provided by the product manufacturer for the materials used in construction, as specified or as provided by the Contractor.

ARTICLE 11: INSURANCE AND BONDS

11.1 The Contractor shall carry all insurance required by law, such as Unemployment Insurance, etc. The Contractor shall carry such insurance coverage as they desire on their own property such as a field office, storage sheds or other structures erected upon the project site that belong to them and for their own use. The Subcontractors involved with this project shall carry whatever insurance protection they consider necessary to cover the loss of any of their personal property, etc.

11.2 Upon being awarded the Contract, the Contractor shall obtain a minimum of two (2) copies of all required insurance certificates called for herein, and submit one (1) copy of each certificate, to the Owner, within 20 days of contract award.

11.3 Bodily Injury Liability and Property Damage Liability Insurance shall, in addition to the coverage included herein, include coverage for injury to or destruction of any property

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arising out of the collapse of or structural injury to any building or structure due to demolition work and evidence of these coverages shall be filed with and approved by the Owner.

11.4 The Contractor's Property Damage Liability Insurance shall, in addition to the coverage noted herein, include coverage on all real and personal property in their care, custody and control damaged in any way by the Contractor or their Subcontractors during the entire construction period on this project.

11.5 Builders Risk (including Standard Extended Coverage Insurance) on the existing building during the entire construction period, shall not be provided by the Contractor under this contract. The Owner shall insure the existing building and all of its contents and all this new alteration work under this contract during entire construction period for the full insurable value of the entire work at the site. Note, however, that the Contractor and their Subcontractors shall be responsible for insuring building materials (installed and stored) and their tools and equipment whenever in use on the project against fire damage, theft, vandalism, etc.

11.6 Certificates of the insurance company or companies stating the amount and type of coverage, terms of policies, etc., shall be furnished to the Owner, within 20 days of contract award.

11.7 The Contractor shall, at their own expense, (in addition to the above) carry the following forms of insurance:

11.7.1 Contractor's Contractual Liability Insurance

Minimum coverage to be:

Bodily Injury	$500,000	for each person
	$1,000,000	for each occurrence
	$1,000,000	aggregate
Property Damage	$500,000	for each occurrence
	$1,000,000	aggregate

11.7.2 Contractor's Protective Liability Insurance

Minimum coverage to be:

Bodily Injury	$500,000	for each person
	$1,000,000	for each occurrence
	$1,000,000	aggregate
Property Damage	$500,000	for each occurrence
	$500,000	aggregate

11.7.3 Automobile Liability Insurance

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Minimum coverage to be:

Bodily Injury	$1,000,000	for each person
	$1,000,000	for each occurrence
Property Damage	$500,000	per accident

11.7.4 Prime Contractor's and Subcontractors' policies shall include contingent and contractual liability coverage in the same minimum amounts as 11.7.1 above.

11.7.5 Workmen's Compensation (including Employer's Liability):

11.7.5.1 Minimum Limit on employer's liability to be as required by law.

11.7.5.2 Minimum Limit for all employees working at one site.

11.7.6 Certificates of Insurance must be filed with the Owner guaranteeing fifteen (15) days prior notice of cancellation, non-renewal, or any change in coverages and limits of liability shown as included on certificates.

11.7.7 Social Security Liability

11.7.7.1 With respect to all persons at any time employed by or on the payroll of the Contractor or performing any work for or on their behalf, or in connection with or arising out of the Contractor's business, the Contractor shall accept full and exclusive liability for the payment of any and all contributions or taxes or unemployment insurance, or old age retirement benefits, pensions or annuities now or hereafter imposed by the Government of the United States and the State or political subdivision thereof, whether the same be measured by wages, salaries or other remuneration paid to such persons or otherwise.

11.7.7.2 Upon request, the Contractor shall furnish Owner such information on payrolls or employment records as may be necessary to enable it to fully comply with the law imposing the aforesaid contributions or taxes.

11.7.7.3 If the Owner is required by law to and does pay any and/or all of the aforesaid contributions or taxes, the Contractor shall forthwith reimburse the Owner for the entire amount so paid by the Owner.

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

12.1 The Contractor shall promptly correct Work rejected by the Owner or failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed, and shall correct any Work found to be not in accordance with the requirements of the Contract Documents within a period of two years from the date of Substantial Completion, or by terms of an applicable special warranty required by the Contract Documents. The provisions of this Article apply to work done by Subcontractors as well as to Work done by direct employees of the Contractor.

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12.2 At any time during the progress of the work, or in any case where the nature of the defects shall be such that it is not expedient to have them corrected, the Owner, at their option, shall have the right to deduct such sum, or sums, of money from the amount of the contract as they consider justified to adjust the difference in value between the defective work and that required under contract including any damage to the structure.

ARTICLE 13: MISCELLANEOUS PROVISIONS

13.1 CUTTING AND PATCHING

13.1.1 The Contractor shall be responsible for all cutting and patching. The Contractor shall coordinate the work of the various trades involved.

13.2 DIMENSIONS

13.2.1 All dimensions shown shall be verified by the Contractor by actual measurements at the project site. Any discrepancies between the drawings and specifications and the existing conditions shall be referred to the Owner for adjustment before any work affected thereby has been performed.

13.3 LABORATORY TESTS

13.3.1 Any specified laboratory tests of material and finished articles to be incorporated in the work shall be made by bureaus, laboratories or agencies approved by the Owner and reports of such tests shall be submitted to the Owner. The cost of the testing shall be paid for by the Contractor.

13.3.2 The Contractor shall furnish all sample materials required for these tests and shall deliver same without charge to the testing laboratory or other designated agency when and where directed by the Owner.

13.4 ARCHAEOLOGICAL EVIDENCE

13.4.1 Whenever in the course of construction, any archaeological evidence is encountered on the surface or below the surface of the ground, the Contractor shall notify the authorities of the Delaware Archaeological Board and suspend work in the immediate area for a reasonable time to permit those authorities, or persons designated by them, to examine the area and ensure the proper removal of the archaeological evidence for suitable preservation in the State Museum.

13.5 GLASS REPLACEMENT AND CLEANING

13.5.1 The General Contractor shall replace without expense to the Owner all glass broken during the construction of the project. If job conditions warrant, at completion of the job the General Contractor shall have all glass cleaned and polished.

13.6 WARRANTY

13.6.1 For a period of two (2) years from the date of substantial completion, as evidenced by the date of final acceptance of the work, the contractor warrants that work performed under this

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contract conforms to the contract requirements and is free of any defect of equipment, material or workmanship performed by the contractor or any of his subcontractors or suppliers. However, manufacturer's warranties and guarantees, if for a period longer than two (2) years, shall take precedence over the above warranties. The contractor shall remedy, at his own expense, any such failure to conform or any such defect. The protection of this warranty shall be included in the Contractor's Performance Bond.

ARTICLE 14: TERMINATION OF CONTRACT

14.1 If the Contractor defaults or persistently fails or neglects to carry out the Work in accordance with the Contract Documents or fails to perform a provision of the Contract, the Owner, after seven days written notice to the Contractor, may make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor. Alternatively, at the Owner's option, and the Owner may terminate the Contract and take possession of the site and of all materials, equipment, tools, and machinery thereon owned by the Contractor and may finish the Work by whatever method the Owner may deem expedient. If the costs of finishing the Work exceed any unpaid compensation due the Contractor, the Contractor shall pay the difference to the Owner.

14.2 "If the continuation of this Agreement is contingent upon the appropriation of adequate state, or federal funds, this Agreement may be terminated on the date beginning on the first fiscal year for which funds are not appropriated or at the exhaustion of the appropriation. The Owner may terminate this Agreement by providing written notice to the parties of such non-appropriation. All payment obligations of the Owner will cease upon the date of termination. Notwithstanding the foregoing, the Owner agrees that it will use its best efforts to obtain approval of necessary funds to continue the Agreement by taking appropriate action to request adequate funds to continue the Agreement."

END OF SECTION

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EMPLOYEE DRUG TESTING REPORT FORM
Period Ending:_____

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors who work on Large Public Works Contracts funded all or in part with public funds submit Testing Report Forms to the Owner no less than quarterly.

Project Number: 200-15704-17002

Project Name: Brandywine School District – Facilities Department Relocation

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____
_____
_____

Number of employees who worked on the jobsite during the report period:_____

Number of employees subject to random testing during the report period:_____

Number of Negative Results _____ Number of Positive Results _____

Action taken on employee(s) in response to a failed or positive random test:
_____
_____
_____

Authorized Representative of Contractor/Subcontractor: _____
(typed or printed)

Authorized Representative of Contractor/Subcontractor: _____
(signature)

Date: _____

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EMPLOYEE DRUG TESTING
REPORT OF POSITIVE RESULTS

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors who work on Large Public Works Contracts funded all or in part with public funds to notify the Owner in writing of a positive random drug test.

Project Number: 200-15704-17002

Project Name: Brandywine School District – Facilities Department Relocation

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____
_____
_____

Name of employee with positive test result: _____

Last 4 digits of employee SSN: _____

Date test results received: _____

Action taken on employee in response to a positive test result:
_____
_____
_____

Authorized Representative of Contractor/Subcontractor: _____
(typed or printed)

Authorized Representative of Contractor/Subcontractor: _____
(signature)

Date: _____

This form shall be sent by mail to the Owner within 24 hours of receipt of test results.

Enclose this test results form in a sealed envelope with the notation "Drug Testing Form – DO NOT OPEN" on the face thereof and place in a separate mailing envelope.

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SECTION 01 10 00

SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work by Owner.
5. Work under separate contracts.
6. Future work.
7. Purchase contracts.
8. Owner-furnished products.
9. Contractor-furnished, Owner-installed products.
10. Access to site.
11. Coordination with occupants.
12. Work restrictions.
13. Specification and drawing conventions.
14. Miscellaneous provisions.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Facilities Department Relocation

1. Project Location: 1000 Pennsylvania Ave, Claymont, DE 19703

B. Owner: Brandywine School District

1. Owner’s Address: 3305 Green Street, Claymont DE 19703

C. Architect: Tetra Tech

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D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. None

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. As indicated on the drawings and project manual.

1.5 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

1.6 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.7 COORDINATION WITH OCCUPANTS

A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
2. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
3. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.8 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

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B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 4:00 p.m., Monday through Friday, unless otherwise indicated.

1. Weekend Hours: Must be arranged in advance.
2. Early Morning Hours: Provide 72 hours' notice.
3. Hours for Utility Shutdowns:
4. Hours for Core Drilling: Provide 72 hours' notice.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Architect or Owner not less than three (3) days in advance of proposed utility interruptions.
2. Obtain Architect and Owner written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Architect and Owner not less than two (2) days in advance of proposed disruptive operations.
2. Obtain Architect and Owner written permission before proceeding with disruptive operations.

E. Controlled Substances: Use of tobacco products and other controlled substances Project site is not permitted.

F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

G. Employee Screening: Comply with Owner's requirements drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

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C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 01 21 00

ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Contingency allowances.

1.3 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.4 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Contractor's overhead, and profit ordered by Owner under the contingency allowance are already included in the allowance and are part of the Contract Sum.

C. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Contingency Allowance: Include a general contingency allowance of $10,000.00.

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 01 22 00

UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

B. Related Requirements:

1. Section 01 21 00 "Allowances" for procedures for using unit prices to adjust quantity allowances.
2. Section 01 26 00 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
3. Section 01 40 00 "Quality Requirements" for field testing by an independent testing agency.

1.3 DEFINITIONS

A. Unit price is[**an amount incorporated into the Agreement, applicable during the duration of the Work as**] a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, [**applicable taxes,**]overhead, and profit.

B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

NOT FOR BIDDING PURPOSES

D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price No. 1: Removal of unsatisfactory soil and replacement with satisfactory soil material.

1. Description: Unsatisfactory soil excavation and disposal off-site and replacement with satisfactory fill material or engineered fill from off-site, as required, according to Section 31 20 00 "Earth Moving."
2. Unit of Measurement: Cubic yard of soil excavated, based on in-place surveys of volume before and after removal.
3. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 01 21 00 "Allowances."

B. Unit Price No. 2: Rock excavation and replacement with satisfactory soil material.

1. Description: Classified rock excavation and disposal off-site and replacement with satisfactory fill material or engineered fill from off-site, as required, according to Section 31 20 00 "Earth Moving."
2. Unit of Measurement: Cubic yard of rock excavated, based on survey of in-place surveys volume of before and after removal.
3. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 01 21 00 "Allowances."

C. Unit Price No. 3: Cutting and patching of concrete slabs-on-grade.

1. Description: Cutting of new or existing concrete slabs-on-grade up to [**6 inches**] <**Insert dimension**> thick, removal and excavation as required, and subsequent backfill, compaction, and patching of concrete according to Section 01 73 00 "Execution." not otherwise indicated in the Contract Documents.
2. Unit of Measurement: Square feet of concrete removed.

D. Unit Price No. 4: Miscellaneous and structural steel.

1. Description: Miscellaneous lintels and other supports not otherwise indicated in the Contract Documents, according to Section 05 12 00 "Structural Steel Framing" and Section 05 50 00 "Metal Fabrications."
2. Unit of Measurement: Cost in place of pounds of fabricated steel as indicated on itemized invoice of steel supplier.

E. Unit Price No. 5: Elevator jack hole rock.

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1. Description: Subsurface soil conditions that refuse conventional auger excavation of the elevator jack hole, according to Section 14 24 00 "Hydraulic Elevators."
2. Unit of Measurement: Depth in feet of drilling required as indicated on the elevator Installer's invoice.
3. Assigned Unit Cost: Owner will pay [**$250.00**] <**Insert dollar amount**> per unit foot of rock drilling required.

F. Unit Price No. <**Insert unit-price number**> - <**Insert unit-price item**>:

1. Description: <**Insert unit-price item description**> according to Section <**Insert Section number**> "<**Insert Section title**>."
2. Unit of Measurement: <**Insert unit of measurement**>.
3. Quantity Allowance: Coordinate unit price with allowance adjustment requirements in Section 01 21 00 "Allowances."

END OF SECTION

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SECTION 01 23 00

ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

NOT FOR BIDDING PURPOSES

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. None at this time.

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 01 21 00 "Allowances" for products selected under an allowance.
2. Section 01 23 00 "Alternates" for products selected under an alternate.
3. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use facsimile of form provided in Project Manual.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.

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b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

B. Quality Assurance

1. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

NOT FOR BIDDING PURPOSES

1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than fifteen (15) days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed unless otherwise indicated.

C. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after commencement of the Work, the Notice to Proceed, or the Notice of Award. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

NOT FOR BIDDING PURPOSES

b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include the following:

1. Division 01 Section "Allowances" for procedural requirements for handling and processing allowances.

1.3 MINOR CHANGES IN THE WORK

A. The Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions".

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: The Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by the Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change. Refer to procedures outlined in the *Supplementary Conditions* of the Contract.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to the Architect. Refer to Procedures outlined in the *Supplementary Conditions* of the Contract.

1.5 ALLOWANCES

A. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 14 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 21 days after such authorization.

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1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, the Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Work Change Directive: The Architect may issue a Work Change Directive on AIA Document G714. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Section 01 21 00 "Allowances" for procedural requirements governing the handling and processing of allowances.
2. Section 01 22 00 "Unit Prices" for administrative requirements governing the use of unit prices.
3. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
4. Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

   a. Application for Payment forms with continuation sheets.
   b. Submittal schedule.
   c. Items required to be indicated as separate activities in Contractor's construction schedule.

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2. Submit the schedule of values to Architect at earliest possible date, but no later than fourteen (14) days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

   a. Project name and location.
   b. Name of Architect.
   c. Architect's project number.
   d. Contractor's name and address.
   e. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

   a. Related Specification Section or Division.
   b. Description of the Work.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that affect value.
   g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

      1) Labor.
      2) Materials.
      3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.

5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

   a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

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9. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
10. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

11. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

    1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Application for Payment Forms: Use as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

    1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
    2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
    3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
    4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

    1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.

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2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Sustainable design submittal for project materials cost data.
4. Contractor's construction schedule (preliminary if not final).
5. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
6. Products list (preliminary if not final).
7. Sustainable design action plans.
8. Schedule of unit prices.
9. Submittal schedule (preliminary if not final).
10. List of Contractor's staff assignments.
11. List of Contractor's principal consultants.
12. Copies of building permits.
13. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
14. Initial progress report.
15. Report of preconstruction conference.

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16. Certificates of insurance and insurance policies.
17. Performance and payment bonds.
18. Data needed to acquire Owner's insurance.

I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

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SECTION 01 31 00

PROJECT MANAGEMENT & COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on the Project including, but not limited to, the following:

1. General project coordination procedures.
2. Coordination Drawings.
3. Administrative and supervisory personnel.
4. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for the Owner and separate contractors if coordination of their Work is required.

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C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of the Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Indicate relationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.

B. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at the Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to the Project.

1. Post copies of list in the Project meeting room, in temporary field office, and by each temporary telephone.

1.5 PROJECT MEETINGS

A. General: The Architectural/Engineering Consultant shall Schedule and conduct meetings and conferences at the Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify the Owner and the Contractor of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including the Owner and the Architect, within 3 days of the meeting.

B. Preconstruction Conference: The Architectural/Engineering Consultant shall Schedule a preconstruction conference before starting construction, at a time convenient to the Owner and the Architect, but no later than 15 days after execution of the Agreement. Hold the conference

NOT FOR BIDDING PURPOSES

at the Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of the Owner, the Contractor, and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing.
    d. Designation of responsible personnel.
    e. Procedures for processing field decisions and Change Orders.
    f. Procedures for processing Applications for Payment.
    g. Distribution of the Contract Documents.
    h. Submittal procedures.
    i. Preparation of Record Documents.
    j. Use of the premises.
    k. Responsibility for temporary facilities and controls.
    l. Parking availability.
    m. Office, work, and storage areas.
    n. Equipment deliveries and priorities.
    o. First aid.
    p. Security.
    q. Progress cleaning.
    r. Working hours.

C. Progress Meetings: The Architectural/Engineering Consultant shall conduct progress meetings at bimonthly intervals. Coordinate dates of meetings with preparation of payment requests.

1. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of the Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to the Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    b. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.

NOT FOR BIDDING PURPOSES

7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Change Orders.
14) Documentation of information for payment requests.

2. Reporting: The Architectural/Engineering Consultant shall distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

   a. Schedule Updating: Revise the Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 01 31 20

PAYROLL REPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for schedules and reports required for proper performance of the Work, including:

1. State of Delaware Payroll Reports.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section "Applications for Payment" specifies requirements for submittal of the Schedule of Values.
2. Division 01 Section "Project Meetings" specifies requirements for submittal and distribution of meeting and conference minutes.

1.3 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of schedules and reports with performance of other construction activities.

1.4 PAYROLL REPORTS

A. State of Delaware Payroll Reports: As required by the State of Delaware, Section 6960, Title 29, of the Delaware Code, payroll wages shall be reported weekly to the Delaware Department of Labor, Division of Industrial Affairs, 4425 North Market Street, Wilmington, DE 19802, phone 302-761-8200. Forms shall be available at the above address. A sample copy of the form is attached under contract forms, State of Delaware Payroll Report.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

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SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Daily construction reports.
5. Material location reports.
6. Field condition reports.
7. Construction photographs.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
4. Division 01 Section "Closeout Procedures" for submitting photographic negatives as Project Record Documents at Project closeout.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor activity is an activity that must be completed before a given activity can be started.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.

NOT FOR BIDDING PURPOSES

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Major Area: A story of construction, a separate building, or a similar significant construction element.

G. Milestone: A key or critical point in time for reference or measurement.

H. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.4 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article and in-house scheduling personnel to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.

C. Contractor's Construction Schedule: Submit three printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period.

D. CPM Reports: Concurrent with CPM schedule, submit three printed copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.

NOT FOR BIDDING PURPOSES

E. Daily Construction Reports: Submit two copies at weekly intervals.

F. Material Location Reports: Submit two copies at weekly intervals.

G. Field Condition Reports: Submit two copies at weekly intervals.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

2. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 15 days after date established for the Notice to Proceed..
2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
3. Use "one workday" as the unit of time.

NOT FOR BIDDING PURPOSES

B. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

   a. Preparation and processing of submittals.
   b. Purchase of materials.
   c. Delivery.
   d. Fabrication.
   e. Installation.

2. Processing: Process data to produce output data or a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
3. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

   a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

2.3 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site.

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. High and low temperatures and general weather conditions.
5. Accidents.
6. Meetings and significant decisions.
7. Unusual events (refer to special reports).
8. Stoppages, delays, shortages, and losses.
9. Meter readings and similar recordings.
10. Emergency procedures.
11. Orders and requests of authorities having jurisdiction.
12. Change Orders received and implemented.
13. Construction Change Directives received.
14. Services connected and disconnected.
15. Equipment or system tests and startups.
16. Partial Completions and occupancies.
17. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

NOT FOR BIDDING PURPOSES

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION (not used)

END OF SECTION

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SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1. Process designated submittals for the Project electronically through designated email system.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

D. Email System: A method to transmit certain electronic submittals between the Contractor, Architect, and Owner, via email.

1. For consistency, the standard file format will be PDF. Convert paper originals and other file formats to PDF prior to submission.

2. In the event of system malfunction, submittals shall be processed in accordance with the Architect’s instructions, until the system malfunction has been corrected.

3. For this Project, process the following submittal types through the designated email system:

a. Product Data.

NOT FOR BIDDING PURPOSES

b. Shop Drawings.
c. Product Schedules.
d. Qualification Data.
e. Certificates (Welding, Installer, Manufacturer, Product, and Material, as applicable).
f. Test Reports (Material, Product, Preconstruction, Compatibility, and Field, as applicable).
g. Research Reports.
h. Warranty (sample).
i. Design Data, including calculations.
j. Coordination Drawings.
k. Delegated-Design Services Certifications.

4. For Samples, provide electronic submittal of Sample cover sheet, identifying location and actual delivery date of Samples. Deliver Samples to location (Architect's office, Project site, etc.) as directed by the Architect.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Where indicated, submit all submittal items required for each Specification Section concurrently.

3. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing Time: Allow sufficient time for submittal review, including time for resubmittals. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

C. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Include a cover sheet on each submittal item for identification. Do not combine different submittals under same cover sheet; only one submittal is to be provided per email.

a. Cover Sheet: Use PDF version of sample form included in Project Manual. Complete each item on form, sign and date. Architect will furnish PDF version of sample form.

2. Name submittal file as directed by Architect.

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3. Transmit each submittal via email using subject line as directed by Architect.

4. Send submittal to designated Project-specific email address:

   a. Use the following email address: IER.Brandywine@tetratech.com

5. Contractor must have a color printer and copier in order to use the electronic submittal process.

D. Resubmittals: Make resubmittals in same form and, for non-electronic submittals, in the same number of copies as initial submittal.

1. Note date and content of revision in label or title block and clearly indicate extent of revision.
2. Resubmit submittals until they are marked with approval notation from Architect.

3. Refer to Supplementary Conditions for provisions allowing Owner to obtain reimbursement from the Contractor for amounts paid to the Architect for evaluation of certain resubmittals.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES, GENERAL

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

2.2 ELECTRONIC SUBMITTAL PROCEDURES

A. Use the designated email system for submittals in this Article.

1. Submit electronic submittals via email as PDF electronic files.

   a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Contractor must have a color printer and copier in order to use the electronic submittal process.

NOT FOR BIDDING PURPOSES

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. Mark submittal to show which products and options are applicable.

2. Include the following information, as applicable:

a. Manufacturer's catalog cuts.
b. Statement of compliance with specified referenced standards.
c. Testing by recognized testing agency.

3. For equipment, include the following in addition to the above, as applicable:

a. Printed performance curves.
b. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of dimensions established by field measurement.
e. Relationship and attachment to adjoining construction clearly indicated.
f. Seal and signature of professional engineer if specified.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Certificates:

1. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

NOT FOR BIDDING PURPOSES

2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

4. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

5. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

G. Test Reports:

1. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

2. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

3. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

4. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

5. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

H. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

I. Warranty: Submit sample warranties as required in individual Specification Sections.

J. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

NOT FOR BIDDING PURPOSES

K. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

L. Delegated-Design Services Certification: Submit certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

2. In addition, for a project in New Jersey, provide three paper copies of certificate, signed and sealed (with raised seal) by the responsible design professional.

2.3 NON-ELECTRONIC SUBMITTAL PROCEDURES

A. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of applicable Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit two full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return one submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

NOT FOR BIDDING PURPOSES

a. Number of Samples: Submit two sets of Samples. Architect will return one set.

1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

B. Shop Drawing Submissions:

1. Submit eight (8) copies for review.

C. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.

2. Number and title of related Specification Section(s) covered by subcontract.

3. Submit subcontract list in the following format:

a. Number of Copies: Four paper copies of subcontractor list, unless otherwise indicated. Architect will return one copy.

D. Key Personnel Names: No later than 15 days after date of Notice of Award, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site.

1. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including emergency, office, and cellular telephone numbers and email addresses.

a. Number of Copies: Four paper copies of key personnel list, unless otherwise indicated.

E. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

F. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

2.4 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

NOT FOR BIDDING PURPOSES

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Identify any deviations from Contract Document requirements. Mark cover sheet with approval before submitting to Architect.

1. Sign and date statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will mark submittal appropriately to indicate action, as follows:

1. Final Unrestricted Release: Where the submittal is marked "Approved," the Work covered by the submittal may proceed provided it complies with the Contract Documents. Final acceptance will depend on that compliance.

2. Final-but-Restricted Release: Where the submittal is marked "Approved as Noted," the Work covered by the submittal may proceed provided it complies both with Architect's notations and corrections on the submittal and the Contract Documents. Final acceptance will depend on that compliance.

3. Resubmit: Where the submittal is marked "Approved, Revise and Return Corrected Copies," the Work covered by the submittal may proceed provided it complies both with Architect's notations and corrections on the submittal and the Contract Documents. Revise submittal according to Architect's notations and corrections and return corrected copies. Final acceptance will depend on that compliance.

4. Rejected: Where the submittal is marked "Rejected," do not proceed with the Work covered by the submittal. Prepare a new submittal for a product that complies with the Contract Documents.

5. Incomplete - Resubmit: Where the submittal is marked "Incomplete, Submit Additional Information," do not proceed with the Work covered by the submittal. Prepare additional information requested, or required by the Contract Documents, that indicates compliance with requirements, and resubmit.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements.

NOT FOR BIDDING PURPOSES

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Limit information submitted to specific products indicated. Do not submit extraneous matter. Submittals containing excessive extraneous matter will be returned for resubmittal without review.

F. Submittals not required by the Contract Documents may be returned by the Architect without action.

Attachment: Cover Sheet

END OF SECTION

NOT FOR BIDDING PURPOSES

CONTRACTOR: _____

_____

SUBMITTAL DATE ____ /____ /____

Check following as applicable:
☐ First Submission
☐ Re-submission

ARCHITECT: Tetra Tech Inc.

PROJECT IDENTIFICATION

Architect's
Project No.: 200-15704-17002

Proj. Name: Facilities Department Relocation

Location: Brandywine School District

PRODUCT IDENTIFICATION

Specification Section No. _____

Submittal No. _____

Name of Product: _____

_____

Name of Manufacturer: _____

SUBCONTRACTOR

_____

SUPPLIER

_____

RELATIONSHIP TO STRUCTURE

Building
Name _____

_____
(Room #) *(Room Name)*

Contract Drawing No.: _____

RESERVED FOR USE BY TETRA TECH

ACTION SUBMITTAL:

☐ Approved

☐ Approved As Noted

☐ Revise and Resubmit

☐ Rejected

INFORMATIONAL SUBMITTAL:

☐ No Action Taken

☐ Returned for Resubmittal

Reviewed By: _____

Date: _____

Reviewed only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Review 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. Review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences or procedures.

DEVIATION FROM CONTRACT DOCUMENTS: _____

_____

_____

CONTRACTOR COMMENTS: _____

_____

_____

ARCHITECT'S COMMENTS: _____

_____

_____

CONTRACTOR'S STAMP

CONTRACTOR'S CERTIFICATION
I CERTIFY THAT THIS SUBMITTAL HAS BEEN REVIEWED AND APPROVED BY THE CONTRACTOR IN ACCORDANCE WITH THE GENERAL CONDITIONS.

BY _____

NOT FOR BIDDING PURPOSES

SECTION 01 33 01

CADD RELEASE

PART 1 - GENERAL (Not Applicable)

PART 2 - PRODUCTS (Not Applicable)

PART 3 - PART 3 - EXECUTION

3.1 USE AND INDEMNIFICATION AGREEMENT

A. Instructions:

1. Please be aware that Tetra Tech charges contractor(s) for electronic files (this applies to files in AutoCAD (or similar) format).

   a. PDF's, which are simply an electronic scan of the drawings, do not require the use of the indemnification form; however we charge $50 per PDF to cover our expenses. Tetra Tech must receive the contractor's check prior to sending PDF's.

2. For AutoCAD type files, the cost is $100 per electronic drawing, regardless of the number of drawings they are requesting. The Use and Indemnification Agreement is to be signed by the Prime Contractor. Should a subcontractor, such as a steel fabricator, ductwork detailer, desire electronic files, they would need to pursue this request through their Prime Contractor who has the contract with the Client.

3. Due to the inherent value to the company of our typical details and our other standards, we limit the drawings types that we will release via this indemnification form to plan type drawings. Typical detail sheets are not to be released in the form of an electronic AutoCAD drawing file.

4. In addition, our internal individual Base Plans will not be released; we limit what the contractor can purchase to the actual individual contract drawings.

5. After the Prime Contractor has determined the number of drawings that they will need, fill out the following two pages. The second page of the form, marked Use and Indemnification Agreement – Business Office, needs to be sent to the Business Office with the Contractor check made out to Tetra Tech. We will not release electronic files until we receive this form and the check.

END OF SECTION

NOT FOR BIDDING PURPOSES

TETRA TECH

240 Continental Drive, Suite 200
Newark, Delaware 19713
Tel. (302) 738-7551
Fax (302) 454-5980

Use and Indemnification Agreement

Re: Brandywine School District – Facilities Department Relocation Tt Project No. 200-15704-17002

Whereas, _____ (hereinafter the "Contractor"), acknowledges that it has requested certain electronic files and/or media of the Drawings and/or Specifications for the above-referenced Project which are the property of Tetra Tech Engineers, Architects & Landscape Architects, P.C. d/b/a Tetra Tech Architects & Engineers (hereinafter "Tetra Tech").

Whereas, Contractor further acknowledges all requests for electronic files require a pre-payment of $100/file (Each individual drawing in the set of Contract Documents represents 1 file), regardless of the number of files requested, prior to receiving said files from Tetra Tech.

Now, therefore, Contractor hereby warrants and covenants that it will abide by the following provisions:

A. *Indemnification*

1. In consideration of permission to use electronic files or media, including but not limited to electronic files of drawings created by use of computer, for the Work of this Project only, and which the Contractor has requested from Tetra Tech, the Contractor, to the fullest extent permitted by law, hereby agrees to indemnify and hold harmless Tetra Tech, its agents, employees, officers , directors and consultants from and against any and all claims, damages, losses and expenses, including any attorneys' fees, arising out of, resulting from or in connection with any and all use of said electronic materials, but only if such claim, damage, loss or expense is caused in whole or in part by the Contractor, its employees, agents, officers, directors, or any other party directly or indirectly employed by any of them or any party for whose acts any of them may be liable, regardless of whether or not it is caused by a party indemnified hereunder. Such obligation shall not be construed to reduce or negate any other right or obligation of indemnification that would otherwise exist as to any party hereto. This indemnification shall not apply to the liability of the indemnitee arising out of its own negligence. This indemnification shall not be limited in any way because of any limitation on damages, compensation or benefits under any statute, law or governmental requirement of any sort.

2. The following shall be included within the definition of "expenses" herein: (a) any time expended by the indemnified party of its employees, agents, officers and directors at their usual and customary billing rates, as well as all out-of-pocket expenses such as long-distance telephone calls, costs of reproduction, expenses of travel and lodging; (b) all costs and expenses of experts, consultants, engineers, and any other party retained by the indemnified party reasonably required to defend the claim; (c) all costs, including reasonable attorneys' fees, incurred in bringing any action to enforce the provisions of this indemnification. The following shall be included within the definition of "action" herein: any case brought in any state or federal court, any arbitration, any mediation, and any similar forum for resolution of any dispute herein, and shall also include any counterclaim or third-party action in any such forum.

B. *Use and Compatibility*

1. Tetra Tech' instruments of service are furnished without guarantee of compatibility with the Contractor's software or hardware, and Tetra Tech' sole responsibility for the electronic media is to furnish a replacement for defective disks within thirty (30) days after delivery to Contractor.

2. Because data stored on electronic media can deteriorate undetected or be modified without Tetra Tech' knowledge, the Contractor agrees that Tetra Tech will not be held liable for the completeness or correctness of the electronic media after an acceptance period of thirty (30) days after delivery of the electronic files. Tetra Tech does confirm the accuracy of the final sealed hard copy drawings, previously submitted pursuant to the Prime Agreement for this Project.

3. The electronic files are submitted to the Contractor for a thirty (30) day acceptance period. During this period, the Contractor may review and examine these files, and any errors detected during this time will be corrected by Tetra Tech. Any changes requested after the acceptance period will be considered additional services to be performed on a time and materials basis, at Tetra Tech's standard cost plus terms and conditions.

4. Tetra Tech retains ownership of the printed hard copy Drawings and Specifications and the electronic media. The Contractor is granted a license for their use, but only in the operation and maintenance of the Project. Use of these materials for modification, extension, or expansion of this Project or on any other project, unless under the direction of Tetra Tech, shall be without liability to Tetra Tech and Tetra Tech's consultants.

IN WITNESS WHEREOF:

Contractor: _____
Signed name: _____
Printed Name: _____
Title: _____
Date: _____

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240 Continental Drive, Suite 200
Newark, Delaware 19713
Tel. (302) 738-7551
Fax (302) 454-5980

Use and Indemnification Agreement – Business Office

Electronic Drawing Files

Prime Contractor Name

Prime Contractor Address

Contact to Receive Invoices

Project Name FACILITIES DEPARTMENT RELOCATION
BRANDYWINE SCHOOL DISTRICT

Project Number 200-15704-17002

Number of Drawing Files (Each individual drawing in the set of Contract Documents represents 1 file)

List each Drawing # Requested

Contractor Signature _____

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SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, may apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, Engineer, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Owner will not provide sewer-service for the project. Contractor shall provide all required temporary sanitary facilities.

C. Water Service: Owner will provide on-site access to water service used by all entities for construction operations.

D. Electric Power Service: Owner will provide on-site access to electric-power-service used by all entities for construction operations. Contractor shall furnish all necessary equipment to facilitate connection to power including coordination of permits with any inspection agency and or installation.

E. Upon completion of the project and prior to demobilization the Contractor shall at his or her sole expense, remove any temporary utility service equipment and restore the service location to its pre-construction condition.

1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Dust-Control Plan: Submit coordination drawing and narrative that indicates the dust-control measures proposed for use, proposed locations, and proposed time frame for their operation.

Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions at each phase of work.
2. Waste handling procedures.
3. Other dust-control measures.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in ADA-ABA Accessibility Guidelines.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Field Offices, General: Shall be set-up in the building.

B. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 6 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
3. Drinking water and private toilet.
4. Coffee machine and supplies.
5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

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C. Storage or Fabrication Sheds: Provide sheds sized, furnished, and equipped or fenced around to accommodate materials and equipment for construction operations as needed for secure area for equipment.

1. Store combustible materials apart from building.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

C. Obtain permission from Owner to us existing Heating and Cooling equipment. Change filters monthly. Provide a set of clean filters when done and two (2) sets of spare filters.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Section 01 10 00 "Summary."

2. Area Available: Designated area as shown on Sheet CC-01.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed and remove prior to demobilization.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

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C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

D. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work if necessary, isolate the HVAC system in area where work is to be performed according to coordination drawings.

a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work if needed. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

E. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Connect temporary service to Owner's existing power source, as directed by Owner.

F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

G. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install a minimum of one telephone line for each field office.

1. Provide additional telephone lines for the following:

a. Provide a dedicated telephone line for each facsimile machine in each field office.

2. At each telephone, post a list of important telephone numbers.

a. Police and fire departments.
b. Ambulance service.
c. Contractor's home office.
d. Contractor's emergency after-hours telephone number.
e. Architect's office.
f. Engineers' offices.
g. Owner's office.
h. Principal subcontractors' field and home offices.

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3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

H. Electronic Communication Service: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access Project electronic documents and maintain electronic communications. Equip computer with not less than the following:

1. Processor: Intel Pentium D or Intel CoreDuo, 3.0 GHz processing speed.
2. Memory: 4 gigabyte.
3. Disk Storage: 300 gigabyte hard-disk drive and combination DVD-RW/CD-RW drive.
4. Display: 22-inch LCD monitor with 256-Mb dedicated video RAM.
5. Full-size keyboard and mouse.
6. Network Connectivity: 10/100BaseT Ethernet.
7. Operating System: Microsoft Windows XP Professional or Microsoft Windows Vista Business.
8. Productivity Software:

   a. Microsoft Office Professional, XP or higher, including Word, Excel, and Outlook.
   b. Adobe Reader 7.0 or higher.
   c. WinZip 7.0 or higher.

9. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these three functions.
10. Internet Service: Broadband modem, router, and ISP, equipped with hardware firewall, providing minimum 384 Kbps upload and 1 Mbps download speeds at each computer.
11. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.
12. Backup: External hard drive, minimum 40 gigabyte, with automated backup software providing daily backups.

3.3 SUPPORT FACILITIES INSTALLATION

A. Parking: Use designated areas of Owner's existing parking areas for construction personnel as directed.

B. Project Signs: Provide Project signs as need and approved by the DEARNG. Unapproved signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project or directions to construction field office.

   a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touchup signs so they are legible at all times.

C. Waste Disposal Facilities: Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

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D. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 73 00 "Execution."

E. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

F. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

G. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

H. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 01 10 00 "Summary."

C. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit by following applicable requirements as stipulated on the Erosion and Sediment Plan Sheets CE-01 to CE-04 approved by DNREC, including CCR if required by DNREC, or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 31 10 00 "Site Clearing."

D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to Erosion and Sediment Plan Sheets CE-01 to CE-04 approved by DNREC and requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.

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2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

E. Stormwater Control: Comply with requirements of authorities having jurisdiction including DNREC and CCR, if required by DNREC. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by existing entrance gates at south entrance.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security of construction area by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

L. Temporary Partitions: If necessary provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.

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a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.

3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
4. Insulate partitions to control noise transmission to occupied areas.
5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
6. Protect air-handling equipment.
7. Provide walk-off mats at each entrance through temporary partition.

M. Temporary Fire Protection: If necessary install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Items C, D, and E below apply only to existing facilities to remain.

C. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

D. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.

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4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

E. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

   a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
   b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
   c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Change over from using temporary security and protection facilities to permanent facilities must occur before Demobilization and prior to Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove

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materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION

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SECTION 01 73 29

CUTTING & PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:

1. Divisions 03 through 09 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety. Operating elements include the following:

1. Fire-suppression systems.
2. Mechanical systems piping and ducts.
3. Control systems.
4. Communication systems.
5. Conveying systems.
6. Electrical wiring systems.

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C. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

D. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

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D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
5. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

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a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:
1. Section 01 73 00 "Execution" for progress cleaning of Project site.

C. Delaware Department of Transportation (DelDOT) Standard Specifications.

D. Delaware Department of Natural Resources and Environmental Control (DNREC) Erosion and Sediment Control Handbook.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

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1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.

   a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.

5. Submit test/adjust/balance records.
6. Submit sustainable design submittals not previously submitted.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

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6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
2. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
3. Submit pest control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

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1. Organize list of spaces in sequential order.
2. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

3. Submit list of incomplete items in the following format:

    a. MS Excel electronic file. Architect will return annotated file.
    b. PDF electronic file. Architect will return annotated file.
    c. Three paper copies. Architect will return two copies.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

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PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 50 00 "Temporary Facilities and Controls" and Section 01 74 19 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

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3.3 SUMMARY OF CLOSEOUT DOCUMENTS

A. Contractor's Affidavit of Payment of Debts and Claims (AIA Document G706)

B. Contractor's Consent of Surety Company to Final Payment (AIA Document G707) (one copy)

C. Contractor's Affidavit of Release of Liens (AIA Document G706A) (one copy)

D. Copy of Letter of Guarantee and Warranty Information (three copies)

E. Balancing Reports

F. Subcontractor's Release of Liens had been submitted with each previous Application of Payment (AIA Document G706A) (one copy)

G. Operation and Maintenance Manuals

H. Record Shop Drawings and Submittals

I. As-built Drawings: All construction changes should be clouded and marked.

1. Updated CAD files to reflect changes and as-built conditions; AutoCadd dwg file 2010 to 2014 format.

2. Three (3) hard copies of As-builts.

J. Affidavit of Discharge of State Tax Liability (Furnish an affidavit from the State Tax Department that all liabilities thereunder have been discharged by the Contractor and all subcontractors. (Delaware Division of Revenue, Mr. William Kirby, 302-577-8259).

K. Punch List Closeout Letter

L. Electrical Inspection Certificate

M. Bond Certification

N. Boiler Startup and Combustion Reports

END OF SECTION

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SCHEDULE OF SPECIAL INSPECTIONS

P – Perform these Special Inspections tasks for each welded joint or member. (AISC 360 & AISC 341)

O – Observe these Special Inspections items on a random daily basis. Operations need not be delayed pending these inspections. (AISC 360 & AISC 341)

D – Document, with a report, that the work has been performed in accordance with the contract documents. (AISC 341)

C – Continuous Special Inspections is the constant monitoring of specific tasks by a special inspector. These inspections must be carried out continuously over the duration of the particular tasks. (IBC)

P – Periodic Special Inspections is Special Inspections by the special inspector who is intermittently present where the work to be inspected has been or is being performed. (IBC)

STRUCTURAL STEEL

PRIOR TO WELDING (Table N5.4-1, AISC 360-10 & TABLE J6-1, AISC 341-10)				
Required	Task	Perform	Observe	Description
☒	1. Verify welding procedures (WPS) and consumable certificates	P	-	
☒	2. Material identification (Type/Grade)	-	O	
☒	3. Welder identification system	-	O	A system shall be maintained by which a welder who has welded a joint or member can be identified. Stamps, if used, shall be the low-stress dye type.
☒	4. Fit-up groove welds (including joint geometry)	-	O	• Joint preparation • Dimensions (alignment, root opening, root face, bevel) • Cleanliness (condition of steel surfaces) • Tacking (tack weld quality and location) • Backing type and fit (if applicable)
☒	5. Configuration and finish of access holes	-	O	
☒	6. Fit-up of fillet welds	-	O	• Dimensions (alignment, gaps at root) • Cleanliness (condition of steel surfaces) • Tacking (tack weld quality and location)

NOT FOR BIDDING PURPOSES

STRUCTURAL STEEL

DURING WELDING (Table N5.4-2, AISC 360-10 & TABLE J6-2, AISC 341-10)				
Required	Task	Perform	Observe	Description
☒	1. Use of qualified welders	-	O	
☒	2. Control and handling of welding consumables	-	O	• Packaging • Exposure control.
☒	3. No welding over cracked tack welds	-	O	
☒	4. Environmental conditions	-	O	• Wind speed within limits • Precipitation and temperature
☒	5. WPS followed	-	O	• Settings on welding equipment • Travel speed • Selected welding materials • Shielding gas type/flow rate • Preheat applied • Interpass temperature maintained (min./max.) • Proper position (F, V, H, OH) • Intermix of filler metals avoided unless approved
☒	6. Welding techniques	-	O	• Interpass and final cleaning • Each pass within profile limitations • Each pass meets quality requirements

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STRUCTURAL STEEL

AFTER WELDING (TABLE N5.4-3, AISC 360-10 & TABLE J6-3, AISC 341-10):				
Required	Task	Perform	Observe	Description
☒	1. Welds cleaned	-	O	
☒	2. Size, length, and location of welds	P	-	
☒	3. Welds meet visual acceptance criteria	P	-	• Crack prohibition • Weld/base-metal fusion • Crater cross section • Weld profiles • Weld size • Undercut • Porosity
☒	4. Arc strikes	P	-	
☒	5. k-area	P	-	When welding of doubler plates, continuity plates or stiffeners has been performed in the k-area, visually inspect the web k-area for cracks within 3 in. of the weld.
☒	6. Backing removed and weld tabs removed (if required)	P	-	
☒	7. Backing removed, weld tabs removed and finished, and fillet welds added (if required)	P/D	-	
☒	8. Placement of reinforcing or contouring fillet welds (if required)	P/D	-	
☒	9. Repair activities	P	-	
☒	10. Document acceptance or rejection of welded joint/member	P	-	

NOT FOR BIDDING PURPOSES

STRUCTURAL STEEL

NONDESTRUCTIVE TESTING (SECTION N5.5, AISC 360-10 & SECTION J6.2, AISC 341-10):				
Required	Task	Perform	Observe	Description
☐	1. CJP welds (Risk Cat. II)	-	O	Ultrasonic testing shall be performed on 10% of CJP groove welds in butt, T- and corner joints subject to transversely applied tension loading in materials 5/16-inch thick or greater. Testing rate must be increased if > 5% of welds tested have unacceptable defects.
☒	2. CJP welds (Risk Cat. III, IV or V)	-	O	Ultrasonic testing shall be performed on all CJP groove welds in butt, T- and corner joints subject to transversely applied tension loading in materials 5/16-inch thick or greater.
☒	3. CJP welds	-	O	Ultrasonic testing shall be performed on 100% of CJP groove welds in materials 5/16-inch or greater. Magnetic particle testing shall be performed on 25% of all beam-to-column CJP groove welds.
☐	4. Access holes (flange > 2”)	-	O	Thermally cut surfaces of access holes shall be MT or PT when the flange thickness exceeds 2 in. for rolled shapes, or when the web thickness exceeds 2 in. for built-up shapes. Any cracks shall be deemed unacceptable regardless of size or location.
☐	5. Welded joints subject to fatigue	-	O	Radiographic or Ultrasonically inspect welded joints identified on the contract documents to be subject to fatigue per sections 5.1, 5.2, 5.3, 5.4, 6.1, 6.2, and 6.3 of Table A-3.1, AISC 360-10.

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STRUCTURAL STEEL

NONDESTRUCTIVE TESTING (SECTION N5.5, AISC 360-10 & SECTION J6.2, AISC 341-10):				
Required	Task	Perform	Observe	Description
☒	6. K-area NDT	P	-	Where welding of doubler plates, continuity plates or stiffeners has been performed in the k-area, the web shall be tested for cracks using magnetic particle testing (MT). The MT inspection area shall include the k-area base metal within 3-inches of the weld. The MT shall be performed no sooner than 48 hours following completion of the welding.
☐	7. Base metal NDT for lamellar tearing and laminations	-	O	After joint completion, base metal thicker than 1 1/2 in. loaded in tension in the through-thickness direction in tee and corner joints, where the connected material is greater than 3/4 in. and contains CJP groove welds, shall be ultrasonically tested for discontinuities behind and adjacent to the fusion line of such welds.
☐	8. Beam cope and access hole	-	O	At welded splices and connections, thermally cut surfaces of beam copes and access holes shall be tested using magnetic particle testing or penetrant testing, when the flange thickness exceeds 1 1/2 in. for rolled shapes, or when the web thickness exceeds 1 1/2 in. for built-up shapes.
☐	9. Reduced beam section repair	-	O	Magnetic particle testing shall be performed on any weld and adjacent area of the reduced beam section (RBS) cut surface that has been repaired by welding, or on the base metal of the RBS cut surface if a sharp notch has been removed by grinding.
☐	10. Weld tab removal sites	-	O	At the end of welds where weld tabs have been removed, magnetic particle testing shall be performed on the same beam-to-column joints receiving UT.

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STRUCTURAL STEEL

PRIOR TO BOLTING (TABLE N5.6-1, AISC 360-10 & TABLE J7-1, AISC 341-10):				
Required	Task	Perform	Observe	Description
☒	1. Manufacture's certification available for fastener materials	P	-	
☒	2. Fasteners marked in accordance with ASTM requirements	-	O	
☒	3. Proper fasteners selected for joint detail (grade, type, bolt length if threads are to be excluded from shear plane	-	O	
☒	4. Proper bolting procedure selected for joint detail	-	O	
☒	5. Connecting elements, including appropriate faying surface condition and hole preparation, if specified, meet applicable requirements	-	O	
☒	6. Pre-installation verification testing by installation personnel observed and documented for fastener assemblies and methods used	-	O	
☒	7. Proper storage provided for bolts, nuts, washers, and other fastener components	-	O	

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STRUCTURAL STEEL

DURING BOLTING (TABLE N5.6-2, AISC 360-10 & TABLE J7-2, AISC 341-10):				
Required	Task	Perform	Observe	Description
☒	1. Fastener assemblies of suitable condition, paced in all holes and washers (if required) are positioned as required	-	O	
☒	2. Joint brought to the snug-tight condition prior to pretensioning operations	-	O	
☒	3. Fastener component not turned by the wrench prevented from rotating	-	O	
☒	4. Fasteners are pretensioned in accordance with RCSC Specification, progressing systematically from the most rigid point toward the free edges	-	O	
AFTER BOLTING (TABLE N5.6-3, AISC 360-10 & TABLE J7-3, AISC 341-10):				
Required	Task	Perform	Observe	Description
☒	Document acceptance or rejection of bolted connections	P	-	
OTHER STEEL INSPECTIONS (SECTION N5.7, AISC 360-10):				
Required	Task	Perform	Observe	Description
☒	1. Anchor rods and other embedments supporting structural steel	P	-	Verify the diameter, grade, type, and length of the anchor rod or embedded item, and the extent or depth of embedment prior to placement of concrete.
☒	2. Fabricated steel or erected steel frame	-	O	Verify compliance with the details shown on the construction documents, such as braces, stiffeners, member locations and proper application of joint details at each connection.

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STRUCTURAL STEEL

OTHER STEEL INSPECTIONS (Tables J8-1 & J10-1, AISC 341-10):				
Required	Task	Perform	Observe	Description
☐	1. Reduced beam sections (RBS)	P/D	-	• Contour and finish • Dimensional tolerances
☐	2. Protected zones	P/D	-	No holes or unapproved attachments made by fabricator or erector
☐	3. H-piles	P/D	-	No holes or unapproved attachments made by the responsible contractor
STEEL ELEMENTS OF COMPOSITE CONSTRUCTION PRIOR TO CONCRETE PLACEMENT (TABLE N6.1, AISC 360-10):				
Required	Task	Perform	Observe	Description
☒	1. Placement and installation of steel deck	P	-	
☐	2. Placement and installation of steel headed stud anchors	P	-	
☒	3. Document acceptance or rejection of steel elements	P	-	
COMPOSITE STRUCTURES PRIOR TO CONCRETE PLACEMENT (TABLE J9-1, AISC 341-10):				
Required	Task	Perform	Observe	Description
☐	1. Material identification of reinforcing steel (Type/Grade)		O	
☐	2. Determination of carbon equivalent for reinforcing steel other than ASTM A706	-	O	
☐	3. Proper reinforcing steel size, spacing and orientation	-	O	
☐	4. Reinforcing steel has not been rebent in the field	-	O	
☐	5. Reinforcing steel has been tied and supported as required	-	O	
☐	6. Required reinforcing steel clearances have been provided	-	O	
☐	7. Composite member has required size	-	O	

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STRUCTURAL STEEL

COMPOSITE STRUCTURES DURING CONCRETE PLACEMENT (TABLE J9-2, AISC 341-10):				
Required	Task	Perform	Observe	Description
☒	1. Concrete: Material identification (mix design, compressive strength, maximum large aggregate size, maximum slump)	-	O/D	
☒	2. Limits on water added at the truck or pump	-	O/D	
☒	3. Proper placement techniques to limit segregation	-	O	

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STEEL CONSTRUCTION OTHER THAN STRUCTURAL STEEL

STEEL ROOF AND FLOOR DECKS (IBC TABLE 1705.2.2):				
Required	Task	Continuous	Periodic	Description
☒	1. Material verification of cold-formed steel deck	-	P	Confirm that identification markings are provided to conform to ASTM standards specified on approved construction documents. Verify material with manufacturer's certified test reports.
☐	2. Floor and roof deck welds	-	P	Visual inspection to confirm that welds meet acceptance criteria of AWS D1.3 and verify welder qualifications.
WELDING OF REINFORCING STEEL (IBC TABLE 1705.2.2):				
Required	Task	Continuous	Periodic	Description
☒	1. Verification of weldability	-	P	Verify weldability of reinforcing steel, other than ASTM A 706 based upon carbon equivalent and in accordance with AWS D1.4.
☐	2. Reinforcing steel resisting flexural and axial forces in intermediate or special moment fames, and boundary elements of special structural walls	C	-	Visually inspect all welds in accordance with AWS D1.4.
☐	3. Shear reinforcement	C	-	Visually inspect all welds in accordance with AWS D1.4.
☐	4. Other reinforcing steel	-	P	Visually inspect all welds in accordance with AWS D1.4.

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STEEL CONSTRUCTION OTHER THAN STRUCTURAL STEEL

COLD FORMED STEEL (IBC 1705.2.2, 1705.10, 1705.11):				
Required	Task	Continuous	Periodic	Description
☐	1. Trusses spanning 60-feet or greater	-	P	Verify that temporary and permanent truss bracing is installed in accordance with approved truss package.
☐	2. Cold-formed steel light-frame construction welded connections (*, **)	-	P	Visually inspect all welds within the main wind force or seismic force resisting system in accordance with AWS D1.4.
☒	3. Cold-formed steel light-frame construction mechanical connections (*, **)	-	P	Visually inspect all screw attachment, bolting, anchoring and other fastening of components within the main wind force or seismic force resisting system including shear walls, braces, diaphragms, collectors (drag struts) and hold-downs.
☐	4. Cold-formed steel connections (#)	-	P	Verify proper welding operations, screw attachment, bolting, anchoring and other fastening of components within the progressive collapse resisting system, including horizontal tie force elements, vertical tie force elements and bridging elements.

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CONCRETE CONSTRUCTION

IBC TABLE 1705.3, 1705.12.1:				
Required	Task	Continuous	Periodic	Description
☒	1. Reinforcing steel, including prestressing tendons	-	P	Verify prior to placing concrete that reinforcing is of specified type, grade and size; that it is free of oil, dirt and rust; that it is located and spaced properly; that hooks, bends, ties, stirrups and supplemental reinforcement are placed correctly; that lap lengths, stagger and offsets are provided; and that all mechanical connections are installed per the manufacturer's instructions and/or evaluation report.
☒	2. Anchors cast in concrete	-	P	Verify prior to placing concrete that cast in anchors have proper embedment, spacing and edge distance.
☒	3. Post-installed anchors or dowels	C	-	Inspect all post-installed anchors/dowels as required by the approved ICC-ES report.
☒	4. Use of required mix design	-	P	Verify that all mixes used comply with the approved construction documents
☒	5. Concrete slump, air content, and temperature	C	-	At the time fresh concrete is sampled to fabricate specimens for strength test verify these tests are performed.
☒	6. Concrete & shotcrete placement	C	-	Verify proper application techniques are used during concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated.
☒	7. Curing temperature and techniques	-	P	Inspect curing , cold weather protection and hot weather protection procedures.
☐	8. Pre-stressed concrete	C	-	Verify application of prestressing forces and grouting of bonded prestressing tendons in the seismic force-resisting system.

NOT FOR BIDDING PURPOSES

CONCRETE CONSTRUCTION

IBC TABLE 1705.3, 1705.12.1:				
Required	Task	Continuous	Periodic	Description
☐	9. Erection of precast concrete	-	P	Verify that all precast elements are lifted, assembled and braced in accordance with the approved construction documents.
☒	10. In-situ concrete strength verification	-	P	Prior to the removal of shores and forms or the stressing of post tensioned tendons verify that adequate strength has been achieved.
☒	11. Formwork	-	P	Inspect the forms to ensure that they are placed plumb and conform to the shapes, lines, and dimensions of the members as required by the approved construction documents.
☐	12. Reinforcement complying with ASTM A 615 in special moment frames, special structural walls and coupling beams (**)	-	P	Verify that ASTM A 615 reinforcing steel used in these areas complies with ACI 318: 21.1.5.2 by means of certified mill test reports. If this reinforcing steel is to be welded chemical tests shall be performed in accordance with ACI 318: 3.5.2.
☐	13. Reinforcement placement within progressive collapse resisting system (#)	C	-	Visual inspect reinforcing steel placement with a particular emphasis on reinforcing steel anchorages, laps and other details within the progressive collapse resisting system, including horizontal tie force elements, vertical tie force elements and bridging elements.

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SOILS CONSTRUCTION

IBC TABLE 1705.6				
Required	Task	Continuous	Periodic	Description
☒	1. Foundation bearing capacity	-	P	Verify the materials below foundations are adequate to achieve the design bearing capacity.
☒	2. Excavations	-	P	Verify the excavations are extended to the proper depth and have reached proper material.
☒	3. Perform classification and testing of compacted fill materials	-	P	
☒	4. Compacted fill material	C	-	Verify the use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill.
☒	5. Subgrade	-	P	Prior to placement of compacted fill, observe sub-grade and verify that site has been prepared properly.

END OF SECTION

NOT FOR BIDDING PURPOSES

Statement of Special Inspections

Project: Facilities Building Relocation

Location: Pennsylvania Ave. Elementary School Location

Owner: Brandywine School District

Design Professional in Responsible Charge:

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to this project as well as the name of the Special Inspection Coordinator and the identity of other approved agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompass the following disciplines:

☒ Structural ☐ Mechanical/Electrical/Plumbing
☐ Architectural ☐ Other: _____

The Special Inspection Coordinator shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: or ☒ per attached schedule.

Prepared by:

Andrew T. Coats, PE
(type or print name)

Signature — Date: November 10, 2017

Design Professional Seal

Owner's Authorization:

Signature Date

Building Official's Acceptance:

Signature Date

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Schedule of Inspection and Testing Agencies

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

- ☒ Soils and Foundations
- ☒ Cast-in-Place Concrete
- ☐ Precast Concrete
- ☐ Masonry
- ☒ Structural Steel
- ☒ Cold-Formed Steel Framing
- ☐ Spray Fire Resistant Material
- ☐ Wood Construction
- ☐ Exterior Insulation and Finish System
- ☐ Mechanical & Electrical Systems
- ☐ Architectural Systems
- ☐ Special Cases

Special Inspection Agencies	Firm	Address, Telephone, e-mail
1. **Special Inspection Coordinator**		
2. Inspector		
3. Inspector		
4. Testing Agency		
5. Testing Agency		
6. Other		

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official, prior to commencing work.

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SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.

B. Related Requirements:

1. Section 01 10 00 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 01 56 39 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
3. Section 01 73 00 "Execution" for cutting and patching procedures.
4. Section 01 35 16 "Alteration Project Procedures" for general protection and work procedures for alteration projects.
5. Section 31 10 00 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

C. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

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1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection. Indicate proposed locations and construction of barriers.

D. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

E. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 01 32 33 "Photographic Documentation." Submit before Work begins.

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F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.9 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of measured drawings.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

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3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and

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finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least <**Insert number**> hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

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3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

C. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."

D. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section <**Insert Section number and title**> for new roofing requirements.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

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SECTION 03 30 00

CAST-IN-PLACE CONCRETE

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. See Civil Drawings General Notes, Section "Earth Moving" for drainage fill under slabs-on-grade.
2. See Civil Drawings General Notes, Section "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, and other pozzolans, materials subject to compliance with requirements.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete Subcontractor.
   e. Special concrete finish Subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semi-rigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-barrier installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving specified floor and slab flatness and levelness floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Architect.

E. Slab on Grade Contraction/Control Joint Layout: Indicate proposed Slab on Grade Control Joints which meet specified requirements.

1. Location of all Slab on Grade Control Joint are subject to approval of the Architect.
2. Provide dimensions to all Slab on Grade Control Joint locations.
3. Submittal to indicate all items associated with Slab on Grade Control Joints, such as:

a. Second-Pour “Diamonds” around all column pier locations inside Column Isolation Joints.
b. Additional rebar at mid-depth of slab at re-entrant corners, door openings, slab opening, etc.
c. Housekeeping pad layout

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, manufacturer and testing agency.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:

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1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Curing compounds.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Vapor barrier.
11. Semirigid joint filler.
12. Joint-filler strips.
13. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

F. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

G. Field quality-control reports.

H. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

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2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

1.10 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

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1. ACI 301.
2. ACI 117.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

   a. High-density overlay, Class 1 or better.
   b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
   c. Structural 1, B-B or better; mill oiled and edge sealed.
   d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

3. Overlaid Finnish birch plywood.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Galvanized Reinforcing Bars: ASTM A 615, Grade 60, deformed bars, ASTM A 767, Class I zinc coated after fabrication and bending.

C. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.

D. Deformed-Steel Wire: ASTM A 1064/A 1064M.

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2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Zinc Repair Material: ASTM A 780.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars in place precast concrete according to CRSI's "Manual of Standard Practice" of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer coated wire bar supports.

2.5 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C 150, Type I; Type II or Type I/II gray.
2. Fly Ash: ASTM C 618, Class F or C.
3. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag, Type IP, portland-pozzolan, Type IL, portland-limestone, or Type IT, ternary blended cement.

C. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials. ASTM C33, Class 4S coarse aggregate or better, graded, for exterior concrete.

1. Maximum Coarse-Aggregate Size:
   a. 1-1/2 inches nominal, for slabs on grade.
   b. All other concrete: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

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5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

F. Water: ASTM C 94 and potable.

2.6 FIBER REINFORCEMENT

A. Synthetic Macro-Fiber: Polyolefin macro-fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 1 to 2-1/4 inches long.

B. Synthetic Micro-Fiber: Monofilament polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 to 2-1/4 inches long.

2.7 VAPOR BARRIER

A. Vapor Barrier: Water-vapor transmission rate (permeance) less than 0.015 perms (gr/ft2/hr/in-Hg), in accordance with ASTM E 1745. The product must meet water-vapor transmission rate (0.01 perms) requirement for both the new material and the ASTM E 1745 mandatory conditioning test (ASTM E 1745; paragraph 7.12 through 7.15.) Provide all manufacturers' accessories required for complete installation including mastic and seam tape. Seam tape to be provided with a water-vapor transmission rate of 0.3 perms or lower.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Layfield Construction Materials: VaporFlex 15.
   b. Reef Industries, Inc.; Griffolyn Vaproguard.
   c. Stego Industries, LLC; Stego Wrap 15 mil Class A.

2.8 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

2.9 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

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2.10 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Bonding Agent: ASTM C 1059, Type II, nonredispersible, acrylic emulsion or styrene-butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types I and II, nonload bearing or Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

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1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Use fly ash, and pozzolan, as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, and concrete with a w/c ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings and Foundation Walls: Normal-weight concrete.

1. Minimum Compressive Strength 4,000 psi at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Slump Limit:4 inches, 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixtureplus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inchnominal maximum aggregate size.

B. Slabs-on-Grade: Normal-weight concrete.

1. Minimum Compressive Strength: 4,000 psi at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Minimum Cementitious Materials Content: 470 lb/cu. yd..
4. Slump Limit: 4 inches plus or minus 1 inch.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
6. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 4.0 lb/cu. yd..
7.

C. Suspended Slabs: Normal-weight concrete.

1. Minimum Compressive Strength: 4000 psi.
2. Maximum W/C Ratio: 0.45.
3. Minimum Cementitious Materials Content: 520 lb/cu. yd..

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4. Slump Limit: 4 inches, 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
6. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.5 lb/cu. yd..

2.14 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

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G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
1. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

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1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR-BARRIER INSTALLATION

A. Sheet Vapor Barriers: Place, protect, and repair sheet vapor barrier according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor barrier. Repair damage and reseal vapor barrier before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780/A 780M. Use galvanized-steel wire ties to fasten zinc-coated steel reinforcement.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
3. Locate horizontal joints in walls and columns at the top of footings or floor slabs.
4. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

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5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction/Control Joints in Slabs-on-Grade: Form weakened-plane contraction/control joints, sectioning concrete into areas as approved in Contractor furnished Slab on Grade Contraction/Control Joint Layout Shop Drawings. Construct contraction/control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction/control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction/control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction/control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
3. Install Contraction/Control Joints at maximum 15 feet in on center in both directions. Install on column lines wherever possible.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 07 92 00 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

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D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleed water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view; to receive a rubbed finish; or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

NOT FOR BIDDING PURPOSES

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces to receive concrete floor topping.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

   a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.

D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEM INSTALLATION

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

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C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 6 inches high unless otherwise indicated, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

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a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 LIQUID FLOOR TREATMENT APPLICATION

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least two month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

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C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

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6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

   a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

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3. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

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3.17 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

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SECTION 05 31 00

STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Composite floor deck.

B. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
2. Section 05 50 00 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.

D. Evaluation Reports: For steel deck, from ICC-ES.

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E. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 COMPOSITE FLOOR DECK

A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Profile Depth: 1-1/2 inches.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: Simple span.

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2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Galvanizing Repair Paint: ASTM A 780/A 780M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

NOT FOR BIDDING PURPOSES

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members with #12 TEK screws @ 30/4 pattern (10” OC) and (3) #10 TEK screw side-lap fasteners per span.

B. Perimeter Edge Fastening: Fasten perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches, and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Prepare test and inspection reports.

3.5 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 05 40 00

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Load-bearing wall framing.
2. Floor joist framing.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
2. Section 09 22 16 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated-Design Submittal: For cold-formed steel framing.

NOT FOR BIDDING PURPOSES

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Product Certificates: For each type of code-compliance certification for studs and tracks.

C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

D. Evaluation Reports: For nonstandard cold-formed steel framing, post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

E. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design cold-formed steel framing.

NOT FOR BIDDING PURPOSES

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on Drawings.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

   a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height.
   b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft..
   c. Floor Joist Framing: Vertical deflection of 1/360 for live loads and 1/240 for total loads of the span.

3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

   a. Upward and downward movement of 1/2 inch.

C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:

1. Floor and Roof Systems: AISI S210.
2. Wall Studs: AISI S211.
3. Headers: AISI S212.
4. Lateral Design: AISI S213.

D. Fire-Resistance Rating: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

2.2 COLD-FORMED STEEL FRAMING MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: As required by structural performance.
2. Coating: G90 or equivalent.

B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.

NOT FOR BIDDING PURPOSES

2. Coating: G90.

2.3 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.
2. Flange Width: 1-3/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches.

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.
2. Flange Width: 1-3/8 inches.

2.4 FLOOR JOIST FRAMING

A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.
2. Flange Width: 1-5/8 inches, minimum.

B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel joists.
2. Flange Width: 1-1/4 inches, minimum.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.

NOT FOR BIDDING PURPOSES

6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole-reinforcing plates.
11. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 55, threaded carbon-steel hex-headed bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 as appropriate for the substrate.

1. Uses: Securing cold-formed steel framing to structure.
2. Type: Torque-controlled expansion anchor or adhesive anchor.
3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

D. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780/A 780M.

B. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C 1107/C 1107M, and with a fluid consistency and 30-minute working time.

C. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

NOT FOR BIDDING PURPOSES

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.8 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

   a. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

NOT FOR BIDDING PURPOSES

B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw or bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 07 21 00 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

NOT FOR BIDDING PURPOSES

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: 24 inches.

B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align floor framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.

E. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.

F. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.
2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

G. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

H. Install horizontal bridging in stud system, spaced vertically 48 inches. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges, and secure solid blocking to stud webs or flanges.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

NOT FOR BIDDING PURPOSES

I. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

J. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: 16 inches.

D. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:

1. Joist-Track Solid Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
2. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

NOT FOR BIDDING PURPOSES

3.6 ERECTION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.7 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing agency will report test results promptly and in writing to Contractor and Architect.

C. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel framing and supports for overhead doors and grilles.
2. Steel framing and supports for countertops.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Shelf angles.
6. Metal ladders.
7. Metal floor plate and supports.
8. Structural-steel door frames.
9. Miscellaneous steel trim including steel angle corner guards steel edgings.
10. Metal bollards.
11. Downspout guards.
12. Abrasive metal nosings and thresholds.
13. Metal downspout boots.
14. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.

NOT FOR BIDDING PURPOSES

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Metal nosings and treads.
2. Paint products.
3. Grout.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel framing and supports for overhead doors and grilles.
2. Steel framing and supports for countertops.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Shelf angles.
6. Metal ladders.
7. Metal floor plate and supports.
8. Structural-steel door frames.
9. Miscellaneous steel trim including steel angle corner guards steel edgings.
10. Metal bollards.
11. Downspout guards.
12. Abrasive metal nosings and thresholds.
13. Metal downspout boots.
14. Loose steel lintels.

C. Samples for Verification: For each type and finish of extruded nosing and tread.

D. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

NOT FOR BIDDING PURPOSES

B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design ladders.

B. Structural Performance of Aluminum Ladders: Aluminum ladders shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

NOT FOR BIDDING PURPOSES

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.

D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

F. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

G. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallically bonded to steel.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work included, but are not limited to the following:

a. Harsco Industrial IKG
b. SlipNOT Metal Safety Flooring; W.S. Molnar Company.

H. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

I. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

J. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: 1-5/8 by 1-5/8 inches or As indicated.
2. Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33, with G90 coating; 0.079-inch nominal thickness, minumum.
3. Material: Cold-rolled steel, ASTM A 1008/A 1008M, structural steel, Grade 33; 0.0966-inch minimum thickness; hot-dip galvanized after fabrication.

K. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

L. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.

M. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

N. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.

NOT FOR BIDDING PURPOSES

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.

E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

G. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 09 91 23 Interior Painting."

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

NOT FOR BIDDING PURPOSES

E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

H. Concrete: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

NOT FOR BIDDING PURPOSES

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize and prime shelf angles located in exterior walls.

D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL LADDERS

A. General:

1. Comply with ANSI A14.3.

B. Steel Ladders:

1. Space siderails 18 inches apart unless otherwise indicated.
2. Siderails: Continuous, steel flat bars, with eased edges.

NOT FOR BIDDING PURPOSES

3. Rungs: 1-inch-square steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.

2.9 METAL FLOOR PLATE

A. Fabricate from rolled-stainless-steel floor plate of thickness indicated below:

1. Thickness: 1/4 inch.

B. Provide stainless-steel angle supports as indicated.

2.10 STRUCTURAL-STEEL DOOR FRAMES

A. Fabricate structural-steel door frames from steel shapes, plates, and bars of size and to dimensions indicated, fully welded together, with 5/8-by-1-1/2-inch steel channel stops, unless otherwise indicated. Plug-weld built-up members and continuously weld exposed joints. Secure removable stops to frame with countersunk machine screws, uniformly spaced at not more than 10 inches o.c. Reinforce frames and drill and tap as necessary to accept finish hardware.

1. Provide with integrally welded steel strap anchors for securing door frames into adjoining concrete or masonry.

B. Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.

C. Galvanize and prime exterior steel frames.

D. Prime exterior steel frames with zinc-rich primer.

2.11 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize and prime exterior miscellaneous steel trim.

D. Prime miscellaneous steel trim with zinc-rich primer.

NOT FOR BIDDING PURPOSES

2.12 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 80 steel pipe.

1. Cap bollards with 1/4-inch-thick steel plate.
2. Where bollards are indicated to receive controls for door operators, provide cutouts for controls and holes for wire.
3. Where bollards are indicated to receive light fixtures, provide cutouts for fixtures and holes for wire.

B. Fabricate bollards with 3/8-inch-thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.

1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.

C. Fabricate sleeves for bollard anchorage from steel pipe or tubing with 1/4-inch-thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.

D. Prime bollards with zinc-rich primer.

2.13 ABRASIVE METAL NOSINGS AND THRESHOLDS

A. Extruded Units: Aluminum, with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work included, but are not limited to the following:

a. American Safety Tread Co., Inc.
b. Amstep Products.
c. Balco, Inc.
d. Wooster Products Inc.

2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch above aluminum extrusion.
3. Provide solid-abrasive-type units without ribs.
4. Nosings: Square-back units, 4 inches wide, for casting into concrete steps.
5. NosingL Beveled-back units, [**3 inches]** [**4 inches].**
6. Treads: Square-back units, full depth of tread with 1-3/8-inch lip, for application over existing stairs.

B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

NOT FOR BIDDING PURPOSES

C. Drill for mechanical anchors and countersink. Locate holes not more than 4 inches from ends and not more than 12 inches o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by manufacturer.

1. Provide two rows of holes for units more than 5 inches wide, with two holes aligned at ends and intermediate holes staggered.

D. Apply bituminous paint to concealed surfaces of cast-metal units.

E. Apply clear lacquer to concealed surfaces of extruded units.

2.14 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

C. Prime plates with zinc-rich primer.

2.15 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.

C. Galvanize and prime loose steel lintels located in exterior walls.

2.16 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.17 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

NOT FOR BIDDING PURPOSES

2.18 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless primers specified in Section 09 96 00 "High-Performance Coatings" are indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with "Commercial Blast Cleaning." requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Section 09 96 00 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.19 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

NOT FOR BIDDING PURPOSES

Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for overhead doors and overhead grilles securely to, and rigidly brace from, building structure.

3.3 INSTALLING METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

B. Anchor bollards to existing construction with expansion anchors. Provide four 3/4-inch bolts at each bollard unless otherwise indicated.

1. Embed anchor bolts at least 4 inches in concrete.

3.4 INSTALLING NOSINGS, TREADS, AND THRESHOLDS

A. Center nosings on tread widths unless otherwise indicated.

NOT FOR BIDDING PURPOSES

B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.

C. Seal thresholds exposed to exterior with elastomeric sealant complying with Section 07 92 00 "Joint Sealants" to provide a watertight installation.

3.5 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.6 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 13 "Exterior Painting." And Section 09 91 23 "Interior Painting."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

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PIPE TUBE RAILINGS

NOT FOR BIDDING PURPOSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Stainless Steel pipe and tube railings.

B. Related Sections include the following:

1. Division 02 Section Site work Sections:
   SECTION 32 13 13 – Portland Cement Concrete Paving
   SECTION 03 30 00 - Cast in Place Concrete

1.3 PERFORMANCE REQUIREMENTS

A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Steel: 72 percent of minimum yield strength.

B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails:

   a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
   b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Top Rails of Guards:

   a. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
   b. Uniform and concentrated loads need not be assumed to act concurrently.

3. Infill of Guards:

a. Concentrated load of 200 lbf (0.89 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
b. Uniform load of 25 lbf/sq. ft. (1.2 kN/sq. m) applied horizontally.
c. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of embedded and mechanically connected railings.
2. Grout, anchoring cement, stainless steel and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For professional engineer.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

NOT FOR BIDDING PURPOSES

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating railings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION AND SCHEDULING

A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.2 STEEL

A. Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).

B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide stainless steel satin finish for exterior installations and where indicated.

C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.3 FASTENERS

A. General: Provide the following:

NOT FOR BIDDING PURPOSES

1. Steel Railings: Galvanized steel sleeves and fasteners.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
3. Provide tamper-resistant flat-head machine screws for exposed fasteners, unless otherwise indicated.

D. Anchors: Provide cast-in-place or torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

2.4 MISCELLANEOUS MATERIALS

A. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

D. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.5 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

NOT FOR BIDDING PURPOSES

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections, unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Form changes in direction as follows:

1. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.

J. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of railing members with prefabricated end fittings.

L. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

M. Brackets, Flanges, Fittings, and Anchors: Provide anchoring sleeves, wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

NOT FOR BIDDING PURPOSES

N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

O. For railing posts set in concrete, provide steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with steel plate forming bottom closure.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.7 STEEL FINISHES

A. Galvanized Railings:

1. Stainless Steel exterior satin railings, including hardware, after fabrication.
2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.

B. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

C. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

D. Preparation for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic-phosphate process.

E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed railings:

1. Exterior Railings (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interior Railings (SSPC Zone 1A): SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

F. Apply shop primer to prepared surfaces of railings, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

NOT FOR BIDDING PURPOSES

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to 1 side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

NOT FOR BIDDING PURPOSES

B. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

D. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch (3-mm) buildup, sloped away from post.

E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

3.5 ANCHORING RAILING ENDS

A. Anchor railing ends to concrete and masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends.

3.6 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed gypsum board partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.

3.7 ADJUSTING AND CLEANING

A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

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C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.

D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.8 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

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SECTION 06 10 53

MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Wood blocking, and nailers.
3. Wood furring.
4. Plywood backing panels.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

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1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.
5. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

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B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
3. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841. For enclosed roof framing, framing in attic spaces, and where high-temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

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E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat all miscellaneous carpentry unless otherwise indicated. items indicated on Drawings, and the following:

1. Framing for raised platforms.
2. Concealed blocking.
3. Wood cants, nailers, blocking, and similar members in connection with roofing.
4. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Cants.
4. Furring.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine or southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. Concealed Boards: 19 percent maximum moisture content of any of the following species and grades:

1. Mixed southern pine or southern pine, No. 3 grade; SPIB.
2. Hem-fir or hem-fir (north), Standard or No. 3 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or spruce-pine-fir, Standard or No. 3 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

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2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M of Type 304 stainless steel.

B. Screws for Fastening to Metal Framing: ASTM C 1002 and ASTM C 954, length as recommended by screw manufacturer for material being fastened.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.7 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

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1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

H. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

J. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

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C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

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SECTION 06 41 16

PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

NOT FOR BIDDING PURPOSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.
3. Reception Desk and Cubbies

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
2. Section 123623.13 "Plastic-Laminate-Clad Countertops."
3. Section 123661.16 "Solid Surfacing Countertops.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products high-pressure decorative laminate cabinet hardware and accessories.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.

2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural plastic-laminate cabinets.
4. Apply WI Certified Compliance Program label to Shop Drawings.
5. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples for Initial Selection:

1. Plastic laminates.
2. PVC edge material.
3. Thermoset decorative panels.

D. Samples for Verification:

1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish.
2. Wood-grain plastic laminates, 12 by 24 inches, for each type, pattern and surface finish.
3. Thermoset decorative panels, 8 by 10 inches, for each color, pattern, and surface finish.
4. Corner pieces as follows:

   a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
   b. Miter joints for standing trim.

5. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer/fabricator.

B. Product Certificates: For each type of product the following:

1. Composite wood and agrifiber products.
2. Thermoset decorative panels.
3. High-pressure decorative laminate.
4. Glass.
5. Adhesives.

C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates WI Certified Compliance Program certificates.

D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program. Shop is a licensee of WI's Certified Compliance Program.

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B. Installer Qualifications: Fabricator of products Certified participant in AWI's Quality Certification Program Licensee of WI's Certified Compliance Program.

C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

D. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 087111 "Door Hardware (Descriptive Specification)" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

NOT FOR BIDDING PURPOSES

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

1. Provide labels and certificates from AWI WI certification program indicating that woodwork, including installation, complies with requirements of grades specified.
2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Premium.

C. Type of Construction: Frameless.

D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

E. Reveal Dimension: 1/2 inch.

F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Basis of Design: Wilsonart. (See Finish Schedule for style and color)
b. Formica Corporation.
c. Pionite; a Panolam Industries International, Inc. brand.

G. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.
2. Vertical Surfaces: Grade HGS.
3. Edges: 3MM PVC edge banding, selected from a minimum of 12 colors. 3MM to be solid, high impact, purified, color-thru, acid resistant, pre-lamination primed edging, machine-applied with hot melt adhesives, automatically trimmed, inside/outside length-radiused for uniform appearance, buffed and corner-radiused for consistent design.
4. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.

H. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.

a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
b. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.

NOT FOR BIDDING PURPOSES

c. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.

2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
3. Drawer Bottoms: Thermoset decorative panels.

I. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

J. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

K. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.

L. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As indicated on Finish Schedule.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening.

C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

D. Catches: Magnetic catches, BHMA A156.9, B03141.

E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

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F. Shelf Rests: BHMA A156.9, B04013; metal metal, two-pin type with shelf hold-down clip.

G. Drawer Slides: BHMA A156.9.

1. Grade 1 and Grade 2: Side mounted; full-extension type; zinc-plated steel with polymer rollers.
2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
4. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1.
5. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-100.
6. For computer keyboard shelves, provide Grade 1.
7. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-100.

H. Aluminum Slides for Sliding Glass Doors: BHMA A156.9, B07063.

I. Door Locks: BHMA A156.11, E07121.

J. Drawer Locks: BHMA A156.11, E07041.

K. Door and Drawer Silencers: BHMA A156.16, L03011.

L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

M. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate cabinets to dimensions, profiles, and details indicated.

NOT FOR BIDDING PURPOSES

C. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or rough-ing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.

1. Use filler matching finish of items being installed.

NOT FOR BIDDING PURPOSES

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 07 21 00

THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board.
2. Glass-fiber blanket.
3. Loose-fill insulation.
4. Spray-applied cellulosic insulation.

B. Related Requirements:

1. Section 06 16 00 "Sheathing" for foam-plastic board sheathing installed directly over wood or steel framing.
2. Section 07 53 23 "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing" for insulation specified as part of roofing construction.
3. Section 09 29 00 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

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B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.

B. Extruded Polystyrene Board, Type IV: ASTM C 578, Type IV, 25-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. DiversiFoam Products.
b. Dow Chemical Company (The).
c. Owens Corning.

2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 GLASS-FIBER BLANKET

A. Glass Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation.
b. Johns Manville; a Berkshire Hathaway company.
c. Knauf Insulation.
d. Owens Corning.

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2.3 LOOSE-FILL INSULATION

A. Glass-Fiber Loose-Fill Insulation: ASTM C 764, Type I for pneumatic application or Type II for poured application; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation.
b. Johns Manville; a Berkshire Hathaway company.
c. Knauf Insulation.

2.4 SPRAY-APPLIED CELLULOSIC INSULATION

A. Self-Supported, Spray-Applied Cellulosic Insulation ASTM C 1149, Type I (materials applied with liquid adhesive; suitable for either exposed or enclosed applications), chemically treated for flame-resistance, processing, and handling characteristics.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Central Fiber LLC.
b. GreenFiber.
c. Hamilton Manufacturing Inc.
d. International Cellulose Corp.
e. Nu-Wool Co., Inc.

2.5 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AGM Industries, Inc.
b. Gemco.

2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

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a. Gemco.

2. Angle: Formed from 0.030-inch-thick, perforated, galvanized carbon-steel sheet with each leg 2 inches square.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AGM Industries, Inc.
b. Gemco.

2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:

a. Crawl spaces.
b. Ceiling plenums.
c. Attic spaces.

2.6 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

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B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF SLAB INSULATION

A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 24 inches in from exterior walls.

3.4 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
2. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

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3.5 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

C. Loose-Fill Insulation: Apply according to ASTM C 1015 and manufacturer's written instructions. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

1. For cellulosic-fiber loose-fill insulation, comply with CIMA's Bulletin #2, "Standard Practice for Installing Cellulose Insulation."

D. Spray-Applied Cellulosic Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

3.6 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

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SECTION 07 53 23

ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

NOT FOR BIDDING PURPOSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Adhered ethylene-propylene-diene-terpolymer (EPDM) roofing system.
2. Self-adhering, ethylene-propylene-diene-terpolymer (EPDM) roofing system.
3. Mechanically fastened, ethylene-propylene-diene-terpolymer (EPDM) roofing system.
4. Loosely laid and ballasted, ethylene-propylene-diene-terpolymer (EPDM) roofing system.
5. Substrate board.
6. Vapor retarder.
7. Roof insulation.
8. Cover board.
9. Walkways.

B. Section includes installation of sound-absorbing insulation strips in ribs of roof deck. Sound-absorbing insulation strips are furnished under Section 05 31 00 "Steel Decking."

C. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 07 21 00 "Thermal Insulation" for insulation beneath the roof deck.
3. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
4. Section 07 71 00 "Roof Specialties" for roof edge flashings.
5. Section 07 71 29 "Manufactured Roof Expansion Joints" for manufactured roof expansion-joint assemblies.
6. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
7. Section 22 14 23 "Storm Drainage Piping Specialties" for roof drains.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For insulation and roof system component fasteners, include copy of FM Approvals' RoofNav listing.

B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness if insulation.
2. Base flashings and membrane terminations.
3. Flashing details at penetrations.
4. Tapered insulation, thickness, and slopes.
5. Roof plan showing orientation of steel roof deck and orientation of roof membrane and fastening spacings and patterns for mechanically fastened roofing system.
6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
7. Tie-in with air barrier.

C. Samples for Verification: For the following products:

1. Roof membrane and flashings of color required.
2. Aggregate surfacing material in gradation and color required.

D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

a. Submit evidence of complying with performance requirements.

2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Product Test Reports: For components of roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

D. Evaluation Reports: For components of roofing system, from ICC-ES.

1. Field Test Reports:
2. Concrete internal relative humidity test reports.

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3. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

E. Field quality-control reports.

F. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

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1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 20 years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and flashings shall remain watertight.

1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D 3746, ASTM D 4272, or the Resistance to Foot Traffic Test in FM Approvals 4470.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897:

1. Zone 1 (Roof Area Field): 34 psf.
2. Zone 2 (Roof Area Perimeter): 56 psf.

a. Location: From roof edge to 7.8’ inside roof edge.

3. Zone 3 (Roof Area Corners): 84 psf.

a. Location: 7.8’ in each direction from building corner.

D. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

E. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

F. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

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2.2 ETHYLENE-PROPYLENE-DIENE-TERPOLYMER (EPDM) ROOFING

A. EPDM Sheet: ASTM D 4637/D 4637M, Type I, nonreinforced, EPDM sheet.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Carlisle SynTec Incorporated.
b. Firestone Building Products.

2. Thickness: 60 mils, nominal.
3. Exposed Face Color: Black.

2.3 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: 60-mil-thick EPDM, partially cured or cured, according to application.

C. Protection Sheet: Epichlorohydrin or neoprene nonreinforced flexible sheet, 55 to 60 mils thick, recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil.

D. Slip Sheet: Manufacturer's standard of thickness required for application.

E. Vented Base Sheet: ASTM D 4897/D 4897M, Type II; nonperforated, asphalt-impregnated fiberglass reinforced, with mineral granular patterned surfacing on bottom surface.

F. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

G. Roof Vents: As recommended by roof membrane manufacturer.

1. Size: No less than4-inch diameter.

H. Bonding Adhesive: Manufacturer's standard.

I. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 3-inch-wide minimum, butyl splice tape with release film.

J. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.

K. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

L. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening components to substrate, and acceptable to roofing system manufacturer.

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M. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, molded pipe boot flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

2.4 VAPOR RETARDER

A. Self-Adhering-Sheet Vapor Retarder: ASTM D 1970/D 1970M, polyethylene film laminated to layer of rubberized asphalt adhesive, minimum 40-mil-total thickness; maximum permeance rating of 0.1 perm; cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor retarder manufacturer.

2.5 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by EPDM roof membrane manufacturer.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Carlisle SynTec Incorporated.
   b. Firestone Building Products.
   c. GAF.
   d. Johns Manville; a Berkshire Hathaway company.

2. Compressive Strength: 20 psi.
3. Thickness: As indicated on the Drawings.

C. Tapered Insulation: Provide factory-tapered insulation boards.

1. Material: Match roof insulation.
2. Minimum Thickness: 1/4 inch.
3. Slope:

   a. Roof Field: 1/4 inch per foot unless otherwise indicated on Drawings.
   b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

2.6 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

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B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:

1. Modified asphaltic, asbestos-free, cold-applied adhesive.
2. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
3. Full-spread, spray-applied, low-rise, two-component urethane adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 00 "Steel Decking."
4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
5. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than 75 percent, or as recommended by roofing system manufacturer when tested according to ASTM F 2170.

   a. Test Frequency: One test probe per each 1000 sq. ft., or portion thereof,of roof deck, with not less than three test probes.
   b. Submit test reports within 24 hours of performing tests.

6. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
7. Verify that joints in precast concrete roof decks have been grouted flush with top of concrete.
8. Verify that minimum curing period recommended by roof system manufacturer for lightweight insulating concrete roof decks has passed.
9. Verify any damaged sections of cementitious wood-fiber decks have been repaired or replaced.
10. Verify adjacent cementitious wood-fiber panels are vertically aligned to within 1/8 inch

B. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Perform fastener-pullout tests according to roof system manufacturer's written instructions.

1. Submit test result within 24 hours of performing tests.

a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

D. Install sound-absorbing insulation strips according to acoustical roof deck manufacturer's written instructions.

3.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition.

3.4 VAPOR RETARDER INSTALLATION

A. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 and 6 inches, respectively.

1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
2. Seal laps by rolling.

3.5 INSULATION INSTALLATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

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B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Installation Over Metal Decking:

1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows and with long joints continuous at right angle to flutes of decking.

   a. Locate end joints over crests of decking.
   b. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
   c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
   d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
   e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.

      1) Trim insulation so that water flow is unrestricted.

   f. Fill gaps exceeding 1/4 inch with insulation.
   g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
   h. Loosely lay base layer of insulation units over substrate.
   i. Mechanically attach base layer of insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.

      1) Fasten insulation according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.
      2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.

2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.

   a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
   b. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
   c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
   d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
   e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
   f. Trim insulation so that water flow is unrestricted.
   g. Fill gaps exceeding 1/4 inch with insulation.
   h. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
   i. Loosely lay each layer of insulation units over substrate.
   j. Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:

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1) Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
2) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
3) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.6 ADHERED ROOFING INSTALLATION

A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

B. Unroll membrane roof membrane and allow to relax before installing.

C. Start installation of roofing in presence of roofing system manufacturer's technical personnel and Owner's testing and inspection agency.

D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.

F. Hot Roofing Asphalt: Apply a solid mopping of hot roofing asphalt to substrate at temperature and rate required by manufacturer, and install fabric-backed roofing. Do not apply to splice area of roof membrane.

G. Fabric-Backed Roof Membrane Adhesive: Apply to substrate at rate required by manufacturer, and install fabric-backed roof membrane.

H. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeters.

I. Apply roof membrane with side laps shingled with slope of roof deck where possible.

J. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement.

1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
2. Apply lap sealant and seal exposed edges of roofing terminations.
3. Apply a continuous bead of in-seam sealant before closing splice if required by roofing system manufacturer.

K. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape.

1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
2. Apply lap sealant and seal exposed edges of roofing terminations.

L. Factory-Applied Seam Tape Installation: Clean and prime surface to receive tape.

NOT FOR BIDDING PURPOSES

1. Firmly roll side and end laps of overlapping roof membrane to ensure a watertight seam installation.
2. Apply lap sealant and seal exposed edges of roofing terminations.

M. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

N. Spread sealant or mastic bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

O. Adhere protection sheet over roof membrane at locations indicated.

3.7 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

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SECTION 07 71 00

ROOFING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Underlayment Materials.
2. Roof-edge drainage systems.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid heat stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work. Include the following:

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1. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
2. Pattern of seams and layout of fasteners, cleats, clips, and other attachments.
3. Details of termination points and assemblies.
4. Details of special conditions.

C. Samples for Initial Selection: For sealant and each type of roof specialty indicated with factory-applied color finishes.

D. Samples for Verification: For roof-edge drainage systems made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.

E. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

B. Warranty: Executed special warranty.

1.7 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Installer, and installers whose work interfaces with or affects roof specialties including installers of roofing materials and accessories.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.

1.9 WARRANTY

A. Special Warranty: Warranty, as part of special warranty in Division 07 Section “EPDM Roofing”, in which Installer agrees to repair or replace components that fail in materials or workmanship within specified warranty period.

B. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

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1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXPOSED METALS

A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

   1. Surface: Smooth, flat finish.
   2. Exposed Coil-Coated Finishes: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

      a. Two-Coat Fluoropolymer: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

2.2 CONCEALED METALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

B. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

      a. Carlisle Coatings & Waterproofing; CCW WIP 300HT.
      b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
      c. Henry Company; Blueskin PE200 HT.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

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B. Fasteners: Manufacturer's recommended fasteners, of Series 300 stainless steel, suitable for application and designed to meet performance requirements.

1. Exposed Fasteners: Not permitted.

C. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

1. Color: As selected by Architect from manufacturer's full range to match color of roof specialties, unless noted otherwise.

2.5 ROOF-EDGE DRAINAGE SYSTEMS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the following:

1. Gutters: Firestone Building Products; Firestone Industrial Gutter System FS-1 or comparable product.
2. Downspouts: Firestone Building Products; Firestone Downspout (Closed Face) or comparable product.
3. Downspout Boots: Jay R. Smith Mfg. Co.; 1785 or 1786 Series Downspout Boots or comparable product.

B. Gutters: Manufactured in uniform section lengths not exceeding 12 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.

1. Fabricate from the following exposed metal:

a. Formed Aluminum: 0.063 inch thick.

2. Corners: Factory mitered and continuously welded.
3. Gutter Supports: Straps with finish matching the gutters.

C. Downspouts: Plain rectangular complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Formed Aluminum: 0.050 inch thick.

D. Aluminum Finish: Two-coat fluoropolymer.

1. Color: As selected by Architect from manufacturer's full range.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water. Overlap edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

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1. Underlayment: Where installing metal directly on cementitious or wood substrates, install a course of self-adhering, high-temperature sheet underlayment.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 24 inches of corners or intersections unless otherwise shown on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that will penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints with elastomeric sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.4 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 18 inches apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.

1. Install gutter with expansion joints at locations indicated but not exceeding 48 feet apart. Install expansion joint caps.

C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.

1. Provide downspout boots to connect downspouts to underground drainage system indicated. Secure downspout boots to walls with stainless steel flat head bolts.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces. Maintain roof specialties in a clean condition during construction.

B. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

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SECTION 07 84 13

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

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1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
b. Classification markings on penetration firestopping correspond to designations listed by the following:

1) UL in its "Fire Resistance Directory."

C. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. A/D Fire Protection Systems Inc.
2. Grace Construction Products.
3. Hilti, Inc.
4. Johns Manville.
5. NUCO Inc.
6. RectorSeal Corporation.
7. Specified Technologies Inc.
8. 3M Fire Protection Products.
9. Tremco, Inc.; Tremco Fire Protection Systems Group.

2.2 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions, as indicated.
2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. Horizontal assemblies include floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies, as indicated.
2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

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E. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

F. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. Permanent forming/damming/backing materials, including the following:

   a. Slag-wool-fiber or rock-wool-fiber insulation.
   b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
   c. Fire-rated form board.
   d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

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G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.

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2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.

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5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

B. For each location where a fire-resistance-rated floor or wall assembly is penetrated, provide a UL-listed penetration firestopping system selected from the applicable UL number range listed in the following schedule that complies with this Section and that is suitable for the penetration conditions indicated for the Project.

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PENETRATION FIRESTOPPING SCHEDULE
FIRESTOPPING SYSTEMS ARE LISTED USING THE ALPHA-ALPHA-NUMERIC IDENTIFICATION SYSTEM PUBLISHED IN UL'S FIRE RESISTANCE DIRECTORY, VOLS. 2A - 2B

	CONSTRUCTION							
	FLOOR PENETRATION SYSTEMS (FIRST ALPHA COMPONENT = C OR F)				WALL PENETRATION SYSTEMS (FIRST ALPHA COMPONENT = C OR W)			
TYPE OF PENETRANT	CONCRETE FLOORS WITH A MINIMUM THICKNESS LESS THAN OR EQUAL TO 5 INCHES	CONCRETE FLOORS WITH A MINIMUM THICKNESS OF MORE THAN 5 INCHES	FRAMED FLOORS	FLOOR-CEILING ASSEMBLIES CONSISTING OF CONCRETE WITH MEMBRANE PROTECTION	CONCRETE OR MASONRY WALLS WITH A MINIMUM THICKNESS LESS THAN OR EQUAL TO 8 INCHES	CONCRETE OR MASONRY WALLS WITH A MINIMUM THICKNESS OF MORE THAN 8 INCHES	FRAMED WALLS	COMPOSITE PANEL WALLS
NO PENETRATING ITEMS	C-AJ-0001-0999 or F-A-0001-0999	C-BJ-0001-0999 or F-B-0001-0999	F-C-1001-1999		C-AJ-0001-0999, C-BJ-0001-0999, or W-J-0001-0999		W-L-000-1-0999	
METALLIC PIPE, CONDUIT, OR TUBING	C-AJ-1001-1999 or F-A-1001-1999	C-BJ-1001-1999, C-BK-1001-1999, or F-B-1001-1999	F-C-1001-1999	F-E-1001-1999	C-AJ-1001-1999, C-BJ-1001-1999, or W-J-1001-1999	C-BK-1001-1999 or W-K-1001-1999	W-L-1001-1999	W-N-1001-1999
NONMETALLIC PIPE, CONDUIT, OR TUBING	C-AJ-2001-2999 or F-A-2001-2999	C-BJ-2001-2999, C-BK-2001-2999, or F-B-2001-2999	F-C-2001-2999	F-E-2001-2999	C-AJ-2001-2999, C-BJ-2001-2999, or W-J-2001-2999	C-BK-2001-2999 or W-K-2001-2999	W-L-2001-2999	W-N-2001-2999
ELECTRICAL CABLES	C-AJ-3001-3999 or F-A-3001-3999	C-BJ-3001-3999, C-BK-3001-3999, or F-B-3001-3999	F-C-3001-3999	F-E-3001-3999	C-AJ-3001-3999, C-BJ-3001-3999, or W-J-3001-3999	C-BK-3001-3999 or WK-3001-3999	W-L-3001-3999	
CABLE TRAYS WITH ELECTRICAL CABLES	C-AJ-4001-4999 or F-A-4001-4999	C-BJ-4001-4999 or F-B-4001-4999			C-AJ-4001-4999, C-BJ-4001-4999, or W-J-4001-4999	W-K-4001-4999	W-L-4001-4999	
INSULATED PIPES	C-AJ-5001-5999 or F-A-5001-5999	C-BJ-5001-5999, C-BK-5001-5999, or F-B-5001-5999	F-C-5001-5999	F-E-5001-5999	C-AJ-5001-5999, C-BJ-5001-5999, or W-J-5001-5999	C-BK-5001-5999	W-L-5001-5999	W-N-5001-5999

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MISCELLANEOUS ELECTRICAL PENETRANTS	C-AJ-6001-6999 or F-A-6001-6999	C-BJ-6001-6999			C-AJ-6001-6999, C-BJ-6001-6999, or W-BJ-6001-6999	W-L-6001-6999	
MISCELLANEOUS MECHANICAL PENETRANTS	C-AJ-7001-7999 or F-A-7001-7999	C-BJ-7001-7999 or F-B-7001-7999	F-C-7001-7999	F-E-7001-7999	C-AJ-7001-7999, C-BJ-7001-7999, or W-J-7001-7999	W-L-7001-7999	W-L-7001-7999
GROUPINGS OF PENETRATIONS	C-AJ-8001-8999 or F-A-8001-8999	C-BJ-8001-8999 or F-B-8001-8999	F-C-8001-8999	F-E-8001-8999	C-AJ-8001-8999, C-BJ-8001-8999, or W-J-8001-8999	W-L-8001-8999	

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SECTION 07 84 46

FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints in smoke barriers.

1.3 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in

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construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:

1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:

a. Fire-resistive joint system products bear classification marking of qualified testing agency.
b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:

1) UL in its "Fire Resistance Directory."

C. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and

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maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:

1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies, and roofs or roof/ceiling assemblies.
2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. A/D Fire Protection Systems Inc.
   b. Fire Trak Corp.
   c. Grace Construction Products.
   d. Hilti, Inc.
   e. Johns Manville.
   f. Nelson Firestop Products.
   g. NUCO Inc.
   h. Passive Fire Protection Partners.
   i. RectorSeal Corporation.
   j. Specified Technologies Inc.
   k. 3M Fire Protection Products.
   l. Tremco, Inc.; Tremco Fire Protection Systems Group.
   m. USG Corporation.

C. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079.

1. L-Rating: Not exceeding 5.0 cfm/ft of joint at 0.30 inch wg at both ambient and elevated temperatures.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Grace Construction Products.
   b. Hilti, Inc.
   c. Johns Manville.
   d. Nelson Firestop Products.
   e. NUCO Inc.
   f. Passive Fire Protection Partners.
   g. Specified Technologies Inc.
   h. 3M Fire Protection Products.
   i. Tremco, Inc.; Tremco Fire Protection Systems Group.

D. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

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E. Low-Emitting Materials: Fire-resistive joint system sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor’s acceptance of substrates and conditions.

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill material.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

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B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

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3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.7 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.

1. Systems are as indicated on Drawings.

END OF SECTION

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SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

1. Product Data: For sealants, indicating VOC content.

B. Samples: For each kind and color of joint sealant required.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Preconstruction laboratory test reports.

C. Preconstruction field-adhesion-test reports.

D. Field-adhesion-test reports.

E. Sample warranties.

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1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with masonry substrates.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1.7 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. VOC Content: Sealants and sealant primers shall comply with the following:

1. Architectural sealants shall have a VOC content of 250 g/L or less.
2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.

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B.

1. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

2.4 JOINT-SEALANT BACKING

A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) or Type O (open-cell material), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. BASF Corporation; Construction Systems.
2. Construction Foam Products; a division of Nomaco, Inc.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

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PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove laitance and form-release agents from concrete.
2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.2 INSTALLATION OF JOINT SEALANTS

A. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

1. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.3 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints up to 1 inch wide in horizontal nontraffic surfaces.

1. Joint Locations:

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a. Control and expansion joints in ceilings and other overhead surfaces.
b. Other joints as indicated.

2. Urethane Joint Sealant: Single component, nonsag, Class 25.

B. Joint-Sealant Application: Exterior joints in vertical surfaces.

1. Joint Locations:
a. Construction joints in cast-in-place concrete.
b. Control and expansion joints in unit masonry.
c. Joints in dimension stone cladding.
d. Joints in cast stone.
e. Joints between metal panels.
f. Joints between different materials listed above.
g. Perimeter joints between materials listed above and frames of doors, windows and louvers.
h. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50.

C. Joint-Sealant Application: Interior joints up to 1 inch wide in horizontal traffic surfaces.

1. Joint Locations:
a. Isolation joints in cast-in-place concrete slabs.
b. Control and expansion joints in tile flooring.
c. Other joints as indicated.

2. Urethane Joint Sealant: Single component, pourable, traffic grade.

D. Joint-Sealant Application: Interior joints up to 1 inch wide in horizontal nontraffic surfaces.

1. Joint Locations:
a. Control and expansion joints in ceilings and other overhead surfaces.
b. Other joints as indicated.

2. Urethane Joint Sealant: Single component, nonsag, Class 25.

E. Joint-Sealant Application: Interior joints in vertical surfaces.

1. Joint Locations:
a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints of exterior openings.
c. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50.

F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces.

1. Joint Sealant Location:
a. Tile control and expansion joints.
b. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, mildew resistant, acid curing.

G. Joint-Sealant Application: Interior joints in vertical surfaces.

1. Joint Locations:

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a. Vertical joints on exposed surfaces of interior unit masonry, concrete, and gypsum board walls and partitions.
b. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
c. Other joints as indicated.

2. Joint Sealant: Latex.

END OF SECTION 079200

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SECTION 07 92 19

ACOUSTICAL JOINT SEALANTS

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes acoustical joint sealants.

B. Related Requirements:

1. Section 07 92 00 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

1.3 ACTION SUBMITTALS

A. Product Data: For each acoustical joint sealant.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of acoustical joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Acoustical-Joint-Sealant Schedule: Include the following information:

1. Joint sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each kind of acoustical joint sealant, for tests performed by a qualified testing agency.

B. Sample Warranties: For special warranties.

1.5 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.

2.2 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C 834.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
b. Tremco Incorporated; Acoustical Curtainwall sealant.
c. USG Corporation; Sheetrock Acoustical Sealant.

2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

2.3 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by acoustical-joint-sealant manufacturer where required for adhesion of sealant to joint substrates.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.

B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C 919, ASTM C 1193, and manufacturer's written recommendations for closing off sound flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

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3.5 PROTECTION

A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Light frames installed in hollow metal doors.

B. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1.
2. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
3. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
4. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
5. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
6. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
7. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
8. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
9. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
10. ANSI/SDI A122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
11. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
12. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
13. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
14. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
15. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

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B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

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 positive pressure according to UL 10C (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and

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Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.6 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CECO Door Products.
2. Curries Company.
3. Steelcraft.

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2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B.

C. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard vertical steel-stiffener core. Minimum 22 gauge steel-stiffeners at 6 inches on center construction attached by spot welds spaced not more than 5" on centers. Spaces between stiffeners filled with fiberglass insulation (minimum density 0.8#/cubic ft.).
3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3 mm) thick steel, Model 2.
4. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.

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2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.

   a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
4. Vertical Edges: Vertical edges to have the face sheets spot welded and filled full height with an epoxy filler. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Basis of Design:

1. Curries Company Polystyrene Core: 707 Series.
2. Curries Company Steel-Stiffened: 747 Series.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
3. Basis of Design:
   a. Curries Company – M Series.

C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
3. Basis of Design:
   a. Curries Company CM Series.
   b. Curries Company M Series.

D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

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E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

E. Glazing: Comply with requirements in Division 08 Section "Glazing" and with the hollow metal door manufacturer's written instructions.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate,

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frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
5. Electrical Raceways: Provide hollow metal doors to receive electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through-wire transfer hardware or wiring harness specified in hardware sets in Division 08 Sections "Door Hardware". Wire nut connections are not acceptable.

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

   a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Electrical Thru-Wiring: Provide hollow metal frames receiving electrified hardware with loose wiring harness (not attached to open throat components or installed in closed mullion tubes) and standardized Molex™ plug connectors on one end to accommodate up

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to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electric through-wire transfer hardware or wiring harness specified in hardware sets in Division 08 Sections "Door Hardware".

9. Electrical Knock Out Boxes: Factory weld 18 gauge electrical knock out boxes to frame for electrical hardware preps; including but not limited to, electric through wire transfer hardware, electrical raceways and wiring harnesses, door position switches, electric strikes, magnetic locks, and jamb mounted card readers as specified in hardware sets in Division 08 Sections "Door Hardware".

   a. Provide electrical knock out boxes with a dual 1/2-inch and 3/4-inch knockout.
   b. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.
   c. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Section "Door Hardware".
   d. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.

10. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
11. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      1) Two anchors per jamb up to 60 inches high.
      2) Three anchors per jamb from 60 to 90 inches high.
      3) Four anchors per jamb from 90 to 120 inches high.
      4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

   b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      1) Three anchors per jamb up to 60 inches high.
      2) Four anchors per jamb from 60 to 90 inches high.
      3) Five anchors per jamb from 90 to 96 inches high.
      4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
      5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
12. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
13. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

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1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria, recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

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3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

   a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
   b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
   c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
   d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION

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SECTION 08 14 16

FLUSH WOOD DOORS

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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid core doors with wood veneer faces.
2. Factory finishing wood doors.
3. Factory fitting wood doors to frames and factory machining for hardware.
4. Light frames and glazing installed in wood doors.

B. Standards and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ANSI A208.1 – Wood Particleboard.
3. Intertek Testing Service (ITS Warnock Hersey) - Certification Listings for Fire Doors.
4. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
5. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
6. UL 10C - Positive Pressure Fire Tests of Door Assemblies; UL 1784 - Standard for Air Leakage Tests of Door Assemblies.
7. Window and Door Manufacturers Association - WDMA I.S.1-A Architectural Wood Flush Doors.

1.2 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, trim for openings, and WDMA I.S.1-A classifications. Include factory finishing specifications.

B. Shop Drawings shall include:

1. Indicate location, size, and hand of each door.
2. Indicate dimensions and locations of mortises and holes for hardware.
3. Indicate dimensions and locations of cutouts.
4. Indicate requirements for veneer matching.
5. Indicate location and extent of hardware blocking.
6. Indicate construction details not covered in Product Data.
7. Indicate doors to be factory finished and finish requirements.
8. Indicate fire protection ratings for fire rated doors.

C. Samples for Initial Selection: For factory finished doors.

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
2. Corner sections of doors, 8 by 10 inches, with door faces and edges representing actual materials to be used.
   a. Provide samples for each species of veneer and core material.
   b. Finish veneer faced door samples with same materials proposed for factory finished doors.
3. Frames for light openings, 6 inches long, for each material, type, and finish required.

D. Warranty: Provide sample of manufacturer's warranty.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, latest edition, "Industry Standard for Architectural Wood Flush Doors'.

C. Fire Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40" above sill) or UL10C.

1. Oversize Fire Rated Door Assemblies: For units exceeding sizes of tested assemblies provide manufacturer's construction label, indicating compliance to independent 3rd party certification agency's procedure, except for size.
2. Temperature Rise Limit: Where required and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.
   1) Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for receiving, handling, and installing flush wood doors.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package pre-finished doors individually in plastic bags and wrap bundles of doors in plastic sheeting.

C. Mark each door on top rail with opening number used on Shop Drawings.

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1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.6 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
   b. Telegraphing of core construction in wood face veneers exceeding 0.01 inch in a 3-inch span.
2. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 DOOR CONSTRUCTION – GENERAL

A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty; Aesthetic Grade: Premium.

B. Fire Rated Doors: Provide construction and core as needed to provide fire ratings indicated.

1. Category A Edge Construction: Provide fire rated door edge construction with intumescent seals concealed by outer stile (Category A) at 45, 60, and 90 minute rated doors. Comply with specified requirements for exposed edges.
2. Pairs: Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
   a. Provide fire retardant stiles that are listed and labeled for applications indicated without formed steel edges and astragals.

2.2 CORE CONSTRUCTION

A. Particleboard Core Doors:

1. Particleboard: Wood fiber based materials complying with ANSI A208.1 Particleboard standard. Grade LD-2.
2. Adhesive: Fully bonded construction using Polyurethane (PUR) glue.
3. Blocking: As indicated under article “Blocking”.

B. Fire Resistant Composite Core Doors:

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1. Core: Non-combustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire protection rating indicated.
2. Blocking: As indicated under article “Blocking”.
3. Edge Construction: At hinge stiles, provide laminated edge construction with improved screw holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 BLOCKING

A. Non-Fire-Rated Doors:

1. Provide blocking as indicated below:
   a. HB1: 5 inch in doors indicated to have closers and overhead stops.
   b. HB4: Two 5 inch x 14 inch lock blocking, in doors indicated to have exit devices.

B. Fire Rated Doors:

1. Provide blocking as indicated below:
   a. HB1: 5 inch in doors indicated to have closers and overhead stops.
   b. HB4: Two 5 inch x 14 inch lock blocking, in doors indicated to have exit devices.
   c. HB5: Two 5 inch x 14 inch corner blocking, in doors indicated to have flush bolts.

2.4 VENEERED DOORS FOR TRANSPARENT FINISH

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Algoma Hardwoods: Architectural Series.
2. Eggers Industries: Premium Series.
3. Graham: GPD Series.
4. Marshfield: Signature Series.

B. Interior Solid Core Doors:

1. Grade: Premium.
2. Faces: Veneer grades as noted below; veneer minimum 1/50-inch (0.5mm) thickness at moisture content of 12% or less.
   a. Plain Sliced Red Oak, A grade faces.
3. Match between Veneer Leaves: Book match.
4. Assembly of Veneer Leaves on Door Faces:
   a. Balance match.
5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
6. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.
7. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors

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8. Construction: Five plies. Stiles and rails are bonded to core, then entire unit sanded before applying face veneers.
9. At doors over 40% of the face cut-out for lights and or louvers, furnish engineered composite lumber core.

2.5 LIGHT FRAMES AND GLAZING

A. Metal Frames for Light Openings in Fire Rated Doors over 20-minute Rating: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated.

1. Manufacturers:
   a. Air Louver.
   b. All Metal Stamping.
   c. Anemostat.
   d. Pemko.

B. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with the flush wood door manufacturer's written instructions.

2.6 FABRICATION

A. Factory fit doors to suit frame opening sizes indicated.

1. Comply with requirements in NFPA 80 for fire rated doors.
2. Undercut: As required per manufacturer's templates and sill condition.

B. Factory machine doors for hardware that is not surface applied. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed steel edges for hardware for pairs of fire rated doors.

C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Comply with applicable requirements in Division 08 Section "Glazing."
3. Louvers: Factory install louvers in prepared openings.

D. Electrical Raceways: Provide flush wood doors receiving electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through wire transfer hardware or wiring harness specified in hardware sets in Division 08 "Door Hardware". Wire nut connections are not acceptable.

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2.7 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Transparent Finish: Provide a clear protective coating over the wood veneer allowing the natural color and grain of the selected wood species to provide the appearance specified. Stain is applied to the wood surface underneath the transparent finish to add color and design flexibility.

1. Finish: Meet or exceed WDMA I.S. 1A TR8 UV Cured Acrylated Polyester finish performance requirements.
2. Staining:
   a. As selected by Architect from manufacturer's full range.
   b. Custom stain to match architect’s sample.
3. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Installation Instructions: Install doors and frames to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire rated doors in corresponding fire rated frames according to NFPA 80.

C. Factory Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

E. Field modifications to doors shall not be permitted, except those specifically allowed by manufacturer or fire rating requirements.

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3.3 ADJUSTING

A. Operation: Re-hang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

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SECTION 08 31 13

ACCESS DOORS AND FRAMES

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PART 1 - GENERAL

1.1 SUMMARY

A. Section includes access doors and frames for walls and ceilings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Stainless-steel flush access doors with exposed flanges.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES

A. Stainless-Steel Flush Access Doors with Exposed Flanges:

1. Products:

   a. Karp Associates, Inc.; DSC-214M.
   b. Milcor Inc.; MF.

2. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
3. Locations: Wall.
4. Door Size: 14” x 14”
5. Stainless Steel Sheet for Door: Nominal 0.062 inch, 16 gage. Finish: No. 4. Satin polish finish.
6. Frame Material: Same material, thickness, and finish as door.
7. Hinges: Spring-loaded, concealed-pin type or continuous piano.
8. Latch: key operated cylinder lock.

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, [Type 304] [Type 316]. Remove tool and die marks and stretch lines, or blend into finish.

E. Frame Anchors: Same material as door face.

F. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.3 FABRICATION

A. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

C. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
2. Keys: Furnish two keys per lock and key all locks alike.
3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in Section 08 71 00 "Door Hardware."

2.4 FINISHES

A. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

2. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil for topcoat. Color: As selected by Architect from full range of industry colors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION

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SECTION 08 33 23

OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Insulated service doors.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
2. Show locations of controls, locking devices, and other accessories.
3. Include diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
1.

1.5 WARRANTY

A. Special Warranty: Submit a written warranty, executed by CONTRACTOR, Installer, and overhead door manufacturer, agreeing to repair or replace unit and components which fail in materials or workmanship within the specified warranty period. Failures include, but are not necessarily limited to, structural failures including excessive deflection, excessive leakage or

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air infiltration, faulty operation of hardware and operator system, and deterioration of metals, metal finishes, and other materials beyond normal weathering.

1. Submit written warranty in accordance with Section 017836: Warranties.
2. Warranty period for is 3 years or 20,000 cycles (whichever occurs first) after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.

1. Design Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa), acting inward and outward.
2. Testing: According to ASTM E 330.

B. Windborne-Debris Impact Resistance: Provide impact-protective overhead coiling doors that pass missile-impact and cyclic-pressure tests according toASTM E 1996 for Wind Zone 1.

1. Large-Missile Test: For overhead coiling doors located within 30 feet (9.144 m) of grade.

C. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 DOOR ASSEMBLY

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

B. Subject to compliance with requirements, manufacturers offering products which may be incorporated in Work include the following:

1. Overhead Door Corporation, StormTite, Model 625, Insulated Service Door (Basis of Design)
2. Atlas Door Corporation
3. The Cookson Co.
4. North American Rooling Door, Inc.

C. Operation Cycles: Door components and operators capable of operating for not less than 20,000.

D. Curtain R-Value: 6.0 deg F x h x sq. ft./Btu (1.057 K x sq. m/W).

E. Door Curtain Material: Galvanized steel, (22 gauge front slat, 24 gauge back slat).

F. Door Curtain Slats: Flat profile slats of 2-5/8-inch (67-mm) center-to-center height.

G. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick; fabricated from stainless steel] or aluminum extrusions and finished suit type of curtain slats..

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H. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.

I. Hood: Match curtain material and finish.

1. Mounting: As shown on Drawings.

J. Locking Devices: Equip door with slide bolt for padlock] 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.

K. Electric Door Operator:

1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
2. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use.
3. Motor Exposure: Interior.
4. Emergency Manual Operation: Push-up type.
5. Obstruction-Detection Device: Automatic photoelectric sensor.
6. Control Station(s): Interior flush mounted.
7. Other Equipment: Audible and visual signals and Portable radio-control system.

L. Curtain Accessories: Equip door with smoke seals, weatherseals and push/pull handles.

1. Vinyl bottom seal
2. Exterior guide and internal hood seals.
3. Lintel weatherseal

M. Door Finish:

1. Factory Prime Finish: Manufacturer's standard color.
2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.3 MATERIALS, GENERAL

A. 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.

2.4 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. Vision-Panel Glazing: Manufacturer's standard clear glazing, fabricated from transparent acrylic sheet or fire-protection rated glass as required for type of door; set in glazing channel secured to curtain slats.

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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 or UL 723. Enclose insulation completely within slat faces.
3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch (0.25 mm).

B. 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.

2.5 HOODS

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. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.
2. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

2.6 LOCKING DEVICES

A. Locking Device Assembly: Comply with Section 08 71 00 “Door Hardware.”

2.7 CURTAIN ACCESSORIES

A. Smoke Seals: Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.

B. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.

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.

2.8 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.

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B. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.9 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, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.Specific operators may not be available from all door manufacturers, operator features may not be common to all operator manufacturers. Consult door and operator manufacturers for recommendations.

1. Comply with NFPA 70.
2. 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. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.

1. 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. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
3. Coordinate voltage, wiring requirements, and current characteristics of motors with building electrical system. (See electrical Drawings for NEMA type area classifications.)

D. Obstruction Detection Devices: External entrapment protection consisting of indicated 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. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.

E. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

F. 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 (111 N).

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G. 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.

H. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

I. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

J. Portable Radio-Control System: Consisting of two of the following per door operator:

1. Three-channel universal coaxial receiver to open, close, and stop door.
2. Portable control device to open and stop door may be momentary-contact type; control to close door shall be sustained- or constant-pressure type.

K. Steel and Galvanized-Steel Finishes
1. 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

3.1 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. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.

C. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion. Lubricate bearings and sliding parts as recommended by manufacturer. Adjust seals to provide tight fit around entire perimeter.

3.2 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

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SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior and interior storefront framing.
2. Storefront framing for punched openings.
3. Exterior and interior manual-swing entrance doors and door-frame units.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Include plans, elevations, sections, full-size details, and attachments to other work.

1. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

D. Samples: For each exposed finish required.

E. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.

F. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: NFRC-certified energy performance values from manufacturer.

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B. Product test reports.

C. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

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1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.
   d. Loosening or weakening of fasteners, attachments, and other components.
   e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.

E. Structural: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:

   a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft..

2. Entrance Doors:

   a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
   b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..

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H. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.35 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 54 as determined according to NFRC 500.

I. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone 1.

1. Large-Missile Test: For glazed openings located within 30 feet of grade.

J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. EFCO Corporation.
2. Kawneer North America; an Alcoa company.
3. TRACO.
4. Trulite Glass & Aluminum Solutions, LLC.
5. Tubelite Inc.
6. YKK AP America Inc.

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Center.
4. Finish: High-performance organic finish.
5. Fabrication Method: Field-fabricated stick system.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Materials:

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1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

   a. Sheet and Plate: ASTM B 209.
   b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
   c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
   d. Structural Profiles: ASTM B 308/B 308M.

2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

   a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
   b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
   c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

2. Door Design: Wide stile; 5-inch nominal width.
3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

   a. Provide nonremovable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."

B. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door to comply with requirements in this Section.

C. Weather Stripping: Manufacturer's standard replaceable components.

D. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

E. Silencers: BHMA A156.16, Grade 1.

F. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

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2.6 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

1. Sealant shall have a VOC content of 250 g/L or less.~$s~45~S$
2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."~$s~46~S$

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

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2.8 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 70 percent PVDF resin by weight in color coat.

1. Color and Gloss: Each opening will have two colors one for the operable sash and one color for the rest as selected by Architect from Manufacturer's full range. If there is no operable sash, the frame will be one color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 088000 "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

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SECTION 08 51 13

ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes aluminum windows for exterior locations.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Samples: For each exposed product and for each color specified.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Sample warranties.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. Window: 10 years from date of Substantial Completion.
b. Glazing Units: 10 years from date of Substantial Completion.
c. Aluminum Finish: 20 years from date of Substantial Completion.

NOT FOR BIDDING PURPOSES

PART 2 - PRODUCTS

2.1 WINDOW PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Window Certification: AAMA certified with label attached to each window.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows.

1. Minimum Performance Class: AW.
2. Minimum Performance Grade: 50.

C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.60 Btu/sq. ft. x h x deg F (3.43 W/sq. m x K).

D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.27.

E. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 52.

F. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C) ambient; 180 deg F (100 deg C) material surfaces.

2.2 ALUMINUM WINDOWS

A. Casement Window (at Storefront System)

1. Inswing Casement: U-Factor not more than .43 BTU/hr/ft^2/°F.
2. Basis-of-Design Products: Subject to compliance with requirements, provide KAWNEER Series AA 900 ISOWEB (Thermally Broken) Casement Window.
3. Frame Depth: 2-5/8 inches (67 mm).
4. Performance Class and Grade: C-HC90
5. CRF (Inswing): Not less than 64.
6. Forced Entry Resistance: Conform to ASTM F588, Grade 10.
7. Locking: Single handle multi-point locks (standard).

B. Projected Window (at Storefront System)

1. Inswing Projected: U-Factor not more than .43 BTU/hr/ft^2/°F.

NOT FOR BIDDING PURPOSES

2. Basis-of-Design Products: Subject to compliance with requirements, provide KAWNEER Series AA 900 ISOWEB (Thermally Broken) Projected Window.
3. Frame Depth: 2-5/8 inches.
4. Performance Class and Grade: AP-HC90
5. Locking: Single handle multi-point locks (standard).

C. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.

1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.

D. Glass: Clear annealed glass, ASTM C 1036, Type 1, Class 1, q3.

1. Kind: Fully tempered where indicated on Drawings.

E. Insulating-Glass Units: ASTM E 2190. Refer to Division 08 Section "Glazing" for glass units and glazing requirements applicable to aluminum window units.

1. Glass: ASTM C 1036, Type 1, Class 1, q3.

F. Hardware, General: Provide manufacturer's standard corrosion-resistant hardware sized to accommodate sash weight and dimensions.

1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.

G. Projected Window Hardware:

1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E 405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.

a. Type and Style: As selected by Architect from manufacturer's full range of types and styles.

2. Hinges: Non-friction type, not less than two per sash.
3. Lock: Combination lever handle and cam-action lock with concealed pawl and keeper..
4. Limit Devices: Limit clear opening to 4 inches (100 mm) for ventilation; with custodial key release.

H. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

I. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

NOT FOR BIDDING PURPOSES

2.3 ACCESSORIES

A. Subsills: Nonthermal, extruded-aluminum subsills in configurations indicated on Drawings.

B. Interior Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.

C. Panning Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.

2.4 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

1. Type and Location: Full, outside for project-in sashes.

B. Aluminum Frames: Complying with SMA 1004 or SMA 1201.

C. Glass-Fiber Mesh Fabric: 18-by-14 (1.1-by-1.4-mm) or 18-by-16 (1.0-by-1.1-mm) mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D 3656/D 3656M.

1. Mesh Color: Charcoal gray.

2.5 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Glaze aluminum windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.

F. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.

G. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

NOT FOR BIDDING PURPOSES

2.6 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 50 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coatings to exposed metal surfaces to comply with AAMA 2604 and with coating and resin manufacturers' written instructions.

1. Color and Gloss: Each opening will have two colors one for the operable sash and one color for the rest as selected by Architect from manufacturers full range. If there is no operable sash the frame will be one color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

E. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

F. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

G. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

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SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Sliding doors.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.

C. Related Sections:

1. Division 08 Section “Flush Wood Doors”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C - Positive Pressure Fire Tests of Door Assemblies

1.2 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

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1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:
    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.
4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

D. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.3 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

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C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

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1.4 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.5 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.6 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:
1. Ten years for mortise locks and latches.
2. Twenty five years for manual surface door closer bodies.

NOT FOR BIDDING PURPOSES

1.7 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

B. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft at the tested pressure differential of 0.3-inch wg of water.

C. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the DOJ's "2010 ADA Standards for Accessible Design" ICC A117.1 2009.

2.2 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

C. Named Manufacturer's Products: Are considered Basis of Design products, with approved equals.

D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

NOT FOR BIDDING PURPOSES

2.3 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

C. Cylinders: Original manufacturer cylinders complying with the following:
   1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
   2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
   3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
   4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
   5. Keyway: Match Facility Standard.

D. Security Cylinders: ANSI/BHMA A156.5, Grade 1, patented security cylinders and keys able to be used together under the same facility master or grandmaster key system. Cylinders are to be factory keyed.

E. Keying System: Each type of lock and cylinders to be factory keyed.

   1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
   2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
   3. Existing System: Key locks to Owner's existing system.

F. Key Quantity: Provide the following minimum number of keys:

   1. Change Keys per Cylinder: Two (2)
   2. Master Keys (per Master Key Level/Group): Five (5).
   3. Construction Keys (where required): Ten (10).

G. Construction Keying: Provide construction master keyed cylinders.

H. Key Registration List (Bitting List):

   1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
   2. Provide transcript list in writing or electronic file as directed by the Owner.

2.4 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

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2.5 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
   1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
   2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
   3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
   4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:
   1. Strikes for Mortise Locks and Latches: BHMA A156.13.
   2. Strikes for Bored Locks and Latches: BHMA A156.2.
   3. Strikes for Auxiliary Deadlocks: BHMA A156.5.
   4. Dustproof Strikes: BHMA A156.16.

2.6 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:
   1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
   2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
   3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
   4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
   5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
   6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
   7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt and security type fasteners as required for proper installation.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

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2.7 ARCHITECTURAL TRIM

A. Door Protective Trim
   1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
   2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
   3. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
      a. Stainless Steel: 300 grade, 050-inch thick.
   4. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

2.8 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

2.9 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
   1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

NOT FOR BIDDING PURPOSES

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

2.10 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.11 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

NOT FOR BIDDING PURPOSES

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
   1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations.
   1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
   2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
   3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
   4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

NOT FOR BIDDING PURPOSES

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

NOT FOR BIDDING PURPOSES

Hardware Schedule

Manufacturer List

Code	Name
BY	By Others
DM	Dorma Door Controls
LC	LCN Closers
NA	National Guard
OTH	Others
SC	Schlage
SDC	Security Door Controls
ST	Stanley
TR	Trimco
VO	Von Duprin

Option List

Code	Description
17	17 LEVER DESIGN
CD	CYLINDER DOGGING
B4E	BEVELED 4 EDGES
CSK	COUNTER SINKING
ICX	ICX CONST. CORE
10-025	STRIKE-ANSI, 1 3/4" DRS., 1 1/4" X 4 7/8
CSK-AP	COUNTER SINKING
XQ11-948	Cam for Von Duprin Cyl. Dogging (IC)
1/4-20 SSMS/EA	STAINLESS MACH SCREWS/EXPAN ANC.
01 STOP SPACER	BLADE STOP SPACER-PAINTED FINISHES
20 SHOE SUPPORT	CUSH SHOE SUPPORT-PAINTED FINISHES
LL/OUTSIDE ONLY	LESS TRIM OUTSIDE

Finish List

Code	Description
AL	Aluminum
626	Satin Chromium Plated
630	Satin Stainless Steel
GREY	Grey
US26D	Chromium Plated, Dull
US32D	Stainless Steel, Dull

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Hardware Sets

SET #01 - Exterior

Doors: 100-1

1	Continuous Hinge	661HD UL	AL	ST
1	Exit Device	CD 98L x 996L-R&V 17	US32D	VO
1	Rim Cylinder	20-057 ICX	626	SC
1	Mortise Cylinder (Cyl Dog)	20-061 ICX XQ11-948	626	SC
2	Cylinder Core	20-740 As REQ'D	626	SC
1	Closer	4040 XP SCUSH 30 SHOE SUPPORT 61 STOP SPACER	AL	LC
1	Door Position Switch	MC-4		SDC
1	Threshold	896 N 1/4-20 SSMS/EA	AL	NA

NOTE: Balance of weather-stripping by door manufacture. Exit device may be dogged via cylinder for push/pull operation. Coordinate wiring with Related Trades.

SET #02 - Vest

Doors: 100-2

1	Continuous Hinge	661HD UL	AL	ST
1	Exit Device	CD 98L-NL x 996L-NL-R&V 17	US32D	VO
2	Cylinder Core	20-740 As REQ'D	626	SC
1	Rim Cylinder	20-057 ICX	626	SC
1	Mortise Cylinder (Cyl Dog)	20-061 ICX XQ11-948	626	SC
1	Electric Strike	6000 series	630	VO
1	Closer	4040 XP SCUSH 30 SHOE SUPPORT 61 STOP SPACER	AL	LC
1	Card or Remote Release	BY OTHERS		BY
1	Door Position Switch	MC-4		SDC
1	Power Supply	As REQ'D		VO

NOTE: Operation: Door normally closed and locked. Entry by Card Reader or Remote Release by others. Egress always allowed. Mechanical key override. Exit device may be dogged via cylinder for push/pull operation. Coordinate wiring with Related Trades.

SET #03 - Exterior

Doors: 115-2

1	Continuous Hinge	661HD UL	AL	ST
1	Exit Device	CD 98L-NL x 996L-NL-R&V 17	US32D	VO
1	Mortise Cylinder (Cyl Dog)	20-061 ICX XQ11-948	626	SC
1	Rim Cylinder	20-057 ICX	626	SC
2	Cylinder Core	20-740 As REQ'D	626	SC
1	Electric Strike	ES62 FSV LM	630	DM

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1	Closer	4040 XP SHCUSH 30 SHOE SUPPORT 61 STOP SPACER	AL	LC
1	Power Supply	As REQ"D		VO
1	Door Position Switch	MC-4		SDC
1	Threshold	896 N 1/4-20 SSMS/EA	AL	NA
1	Wall A-Phone	BY OTHERRS		**OTH**

NOTE: Balance of weather-stripping by door manufacture. Operation: Door normally closed and locked. Access via the A-phone to call and request entry by remote release (By Others) Egress always allowed. Exit device may be dogged via cylinder for push/pull operation if required. Mechanical key override. Coordinate wiring with Related Trades.

SET #04 - Vest

Doors: 115-1

3	Hinges	CB179 4 1/2 X 4 1/2	US26D	ST
1	Exit Device	98L-BE x 996L-R&V-BE 17	US32D	VO
1	Closer	4040 XP H	AL	LC
1	Armor Plate	KA050 32" x 2" LDW B4E CSK-AP	630	TR
1	Wall Bumper	1270WV	630	TR
1	Gasketing	5050C Head & Jambs		NA

SET #05 - Exterior

Doors: 117-2

1	Continuous Hinge	661HD UL	AL	ST
1	Exit Device	CD 98L-NL x 996L-NL-R&V 17	US32D	VO
1	Mortise Cylinder (Cyl Dog)	20-057 ICX XQ11-948	626	SC
1	Rim Cylinder	20-057 ICX	626	SC
2	Cylinder Core	20-740 As REQ'D	626	SC
1	Electric Strike	ES62 FSV LM	630	DM
1	Closer	4040 XP SHCUSH	AL	LC
1	Power Supply	AS REQ'D		VO
1	Door Position Switch	MC-4		SDC
1	Gasketing	700 NA @ Head & Jambs		NA
1	Drip Cap	16 A - 4" ODW		NA
1	Door Sweep	200 NA		NA
1	Threshold	896 N 1/4-20 SSMS/EA	AL	NA
1	Wall A-Phone	BY OTHERRS		OTH

NOTE: Operation: Door normally closed and locked. Access via the A-phone to call and request entry by remote release (By Others). Egress always allowed. Exit device may be dogged via cylinder for push/pull operation if required.. Mechanical key override. Coordinate wiring with Related Trades

SET #06 - Exterior Shop

Doors: 120-3, 125-3

1	Continuous Hinge	661HD UL	AL	ST
1	Storroom Lockset	L9080T 17A LLL/OUTSIDE ONLY	630	SC
1	Cylinder Core	20-740 As REQ'D	626	SC

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1	Flush Pull	1115C	630	TR
1	Closer	4040 XP SHCUSH	AL	LC
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Door Position Switch	MC-4		SDC
1	Drip Cap	16 A - 4" ODW		NA
1	Gasketing	700 NA @ Head & Jambs		NA
1	Door Sweep	200 NA		NA
1	Threshold	896 N 1/4-20 SSMS/EA	AL	NA

NOTE: Coordinate wiring with Related Trades.

SET #07 - Office

Doors: 104-1, 105-1, 107-1, 108-1, 109-1, 110-1, 111-1, 112-1, 113-1

3	Hinges	CB179 4 1/2 X 4 1/2	US26D	ST
1	Office Lockset	ND50TD SPA 10-025	626	SC
1	Cylinder Core	20-740 As REQ'D	626	SC
1	Wall Bumper	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR

SET #08 - Conference

Doors: 101-1

3	Hinges	CB179 4 1/2 X 4 1/2	US26D	ST
1	Classroom Lockset	ND70TD SPA 10-025	626	SC
1	Cylinder Core	20-740 As REQ'D	626	SC
1	Wall Bumper	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR

SET #09 - Toilet

Doors: 102-1, 103-1, 125-1, 126-1

3	Hinges	CB179 4 1/2 X 4 1/2	US26D	ST
1	Privacy Set	ND40S SPA 10-025	626	SC
1	Wall Bumper	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR

SET #10 - Mech Rm

Doors: 119-1

3	Hinges	CB179 4 1/2 X 4 1/2	US26D	ST
1	Storeroom Lockset	ND80TD SPA 10-025	626	SC
1	Cylinder Core	20-740 As REQ'D	626	SC
1	Closer	4040 XP REG	AL	LC
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
1	Gasketing	5050C Head & Jambs		NA

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SET #11 - IT Rm / Elec Rm

Doors: 116-1, 118-1

3	Hinges	CB179 4 1/2 X 4 1/2	US26D	ST
1	Storeroom Lockset	ND80TD SPA 10-025	626	SC
1	Cylinder Core	20-740 As REQ'D	626	SC
1	Wall Bumper	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR

SET #12 - Compressor Rm

Doors: 120-2

3	Hinges	CB168 5 X 4 1/2 NRP	US26D	ST
1	Storeroom Lockset	ND80TD SPA 10-025	626	SC
1	Cylinder Core	20-740 As REQ'D	626	SC
1	Wall Bumper	1270WV	630	TR
1	Gasketing	5050C Head & Jambs		NA

SET #13 - Storage Room

Doors: 117-1

3	Hinges	CB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Classroom Lockset	ND70TD SPA 10-025	626	SC
1	Cylinder Core	20-740 As REQ'D	626	SC
1	Closer	4040 XP REG	AL	LC
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
1	Wall Bumper	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR

SET #14 - Break Room

Doors: 122-1

3	Hinges	CB179 4 1/2 X 4 1/2	US26D	ST
1	Passage Set	ND10S SPA 10-025	626	SC
1	Closer	4040 XP H	AL	LC
1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
1	Wall Bumper	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR

SET #15 - Computer Room

Doors: 123-1

3	Hinges	CB179 4 1/2 X 4 1/2 NRP	US26D	ST
1	Classroom Lockset	ND70TD SPA 10-025	626	SC
1	Cylinder Core	20-740 As REQ'D	626	SC
1	Closer	4040 XP EDA	AL	LC

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1	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
1	Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
1	Wall Bumper	1270WV	630	TR
3	Door Silencers	1229A	GREY	TR

SET #16 - Alcove

Doors: 114-1

6	Hinges	CB179 4 1/2 X 4 1/2	US26D	ST
2	Pull Plate	1017-3B	630	TR
2	Push Plate	1001-9	630	TR
2	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
2	Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
2	Door Silencers	1229A	GREY	TR

SET #17 - Shop

Doors: 120-1, 124-1

6	Hinges	CB179 4 1/2 X 4 1/2 NRP	US26D	ST
2	Flush Bolt	3917	626	TR
1	Deadlock	L464T	626	SC
1	Cylinder Core	20-740 As REQ'D	626	SC
2	Pull Plate	1017-3B	630	TR
2	Push Plate	1001-9	630	TR
2	Closer	4040 XP SCUSH	AL	LC
2	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
2	Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
2	Door Silencers	1229A	GREY	TR
1	Dustproof Strike	3910	626	TR
1	Astragal Set	115 NA SET		NA

SET #18 - Paint Room

Doors: 121-1

6	Hinges	CB179 4 1/2 X 4 1/2	US26D	ST
2	Flush Bolt	3917	626	TR
1	Classroom Lockset	ND70TD SPA 10-025	626	SC
1	Cylinder Core	20-740 As REQ'D	626	SC
1	Closer	4040 XP REG	AL	LC
2	Kick Plate	K0050 10" x 2" LDW B4E CSK	630	TR
2	Mop Plate	KM050 4" x 1" LDW B4E CSK	630	TR
2	Wall Bumper	1270WV	630	TR
1	Dustproof Strike	3910	626	TR
1	Astragal Set	115 NA SET		NA

SET #19 - Overhead Door

NOT FOR BIDDING PURPOSES

Doors: 120-4, 120-5, 125-4, 125-5

1	Padlock	KS43D		SC
1	Cylinder Core	20-740 As REQ'D	626	SC

NOT FOR BIDDING PURPOSES

SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.
3. Storefront framing.
4. Glazed entrances.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:

1. Design Wind Pressures: As indicated on Drawings.
2. Design Snow Loads: As indicated on Drawings.
3. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.

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4. Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass to resist each of the following combinations of loads:

   a. Outward design wind pressure minus the weight of the glass. Base design on glass type factors for short-duration load.
   b. Inward design wind pressure plus the weight of the glass plus half of the design snow load. Base design on glass type factors for short-duration load.
   c. Half of the inward design wind pressure plus the weight of the glass plus the design snow load. Base design on glass type factors for long-duration load.

5. Glass Type Factors for Patterned Glass:

   a. Short-Duration Glass Type Factor for Patterned Glass: 1.0.
   b. Long-Duration Glass Type Factor for Patterned Glass: 0.6.

6. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
7. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
8. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
9. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

   1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
   2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
   3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
   4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

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1.6 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.7 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. LEED Submittals:

1. Laboratory Test Reports for Credit IEQ 4: For glazing sealants used inside the weatherproofing system, documentation indicating that they comply with the testing and product requirements of the California Department of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Glass Samples: For each type of the following products; 12 inches square.

1. Patterned glass.
2. Viewing mirror glass.
3. Fire-resistive glazing products.
4. Insulating glass.
5. Laminated insulating glass.
6. Patterned insulating glass.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Warranties: Sample of special warranties.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers.

B. Product Certificates: For glass and glazing products, from manufacturer.

C. Preconstruction adhesion and compatibility test report.

1.9 CLOSEOUT SUBMITTALS

A. Warranties: Executed special warranties.

NOT FOR BIDDING PURPOSES

1.10 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Source Limitations for Glass: Obtain tinted float glass, coated float glass, laminated glass, and insulating glass from single source from single manufacturer for each glass type.

C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

E. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

F. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.

G. Insulating Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

H. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed.
2. Review temporary protection requirements for glazing during and after installation.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

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1.12 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.13 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: Five years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

B. Strength: Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

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C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. For uncoated glass, comply with requirements for Condition A.
3. For coated vision glass, comply with requirements for Condition C (other coated glass).

C. Uncoated Tinted Float Glass: Class 2, complying with other requirements specified.

1. Basis-of-Design Product: Subject to compliance with requirements, provide PPG Industries, Inc.; Solexia, or comparable product.
2. Tint Color: Light green.
3. Visible Light Transmittance: 77 percent minimum.

D. Low-E Coated Float Glass: Complying with requirements specified.

1. Basis-of-Design Product: Subject to compliance with requirements, provide PPG Industries, Inc.; Solarban 60, or comparable product.

2.3 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.

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3. Interlayer Color: Clear unless otherwise indicated.

2.4 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
2. Spacer: Manufacturer's standard spacer material and construction.
3. Desiccant: Molecular sieve or silica gel, or blend of both.

2.5 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. EPDM complying with ASTM C 864.
2. Silicone complying with ASTM C 1115.
3. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned EPDM, silicone, or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.6 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

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B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.

C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

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G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.9 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

2.10 MONOLITHIC-GLASS TYPES

A. Glass Type GL-1: Clear fully tempered float glass.

1. Thickness: 6.0 mm.
2. Provide safety glazing labeling.

2.11 INSULATING-GLASS TYPES

A. Glass Type GL-2: Low-e-coated, tinted insulating glass.

1. Overall Unit Thickness: 1 inch.
2. Thickness of Each Glass Lite: 6.0 mm.
3. Outdoor Lite: Tinted fully tempered float glass.
4. Interspace Content: Air.
5. Indoor Lite: Clear fully tempered float glass.
6. Low-E Coating: Pyrolytic or sputtered on third surface.
7. Visible Light Transmittance: 61 percent minimum.
8. Winter Nighttime U-Factor: 0.29 maximum.
9. Summer Daytime U-Factor: 0.27 maximum.
10. Solar Heat Gain Coefficient: 0.36 maximum.
11. Provide safety glazing labeling.

2.12 INSULATING-LAMINATED-GLASS TYPES

A. Glass Type GL-3: Clear insulating laminated glass.

1. Overall Unit Thickness: 1-1/8 inch.
2. Thickness of Outdoor Lite: 6.0 mm.
3. Outdoor Lite: Fully tempered float glass.
4. Interspace Content: Air.
5. Indoor Lite: Clear laminated glass with two plies of fully tempered float glass.

   a. Thickness of Each Glass Ply: 5.0 mm.
   b. Interlayer Thickness: 0.030 inch minimum.

6. Provide safety glazing labeling.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

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F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

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3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

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D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

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SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

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PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation reports for firestop tracks.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.

C. Studs and Runners: ASTM C 645.

1. Steel Studs and Runners:

a. Minimum Base-Metal Thickness: 0.0269 inch.
b. Depth: As indicated on Drawings.

D. Slip-Type Head Joints: Where indicated, provide the following:

1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: 0.0538-inch.

F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch- wide flanges.

1. Depth: 1-1/2 inches.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.

G. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

H. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.

1. Depth: As indicated on Drawings.
2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

B. Hanger Attachments to Concrete:

1. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488/E 488M conducted by a qualified testing agency.
2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

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C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

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B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

   a. Install two studs at each jamb unless otherwise indicated.
   b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
   c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

   a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:

   a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
   b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.

3.3 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

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1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

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SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each texture finish indicated on same backing indicated for Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Ceiling and wall materials shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers.

2.2 GYPSUM BOARD, GENERAL

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.

B. Regional Materials: Products shall be manufactured within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

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C. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. CertainTeed Corporation.
   b. United States Gypsum Company. (USG)

2. Thickness: 5/8 inch.
3. Long Edges: Tapered.

B. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. CertainTeed Corporation.
   b. United States Gypsum Company. (USG)

2. Thickness: 1/2 inch.
3. Long Edges: Tapered.

C. Abuse-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.

1. Core: 5/8 inch, Type X.
2. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
3. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
4. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
5. Long Edges: Tapered.
6. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

D. Mold Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

A. Exterior Gypsum Soffit Board: ASTM C 1396/C 1396M, with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

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a. American Gypsum.
b. CertainTeed Corporation.
c. Continental Building Products, LLC.
d. Georgia-Pacific Building Products.
e. National Gypsum Company.
f. PABCO Gypsum.
g. Temple-Inland Building Products by Georgia-Pacific.
h. United States Gypsum Company.

2. Core: As indicated.

2.5 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
1. USG Corporation, DUROCK Cement Board.
2. Core: 1/2 inch, regular type.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

B. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.
1. Thickness: 1/2 inch.
2. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

a. Cornerbead.
b. Bullnose bead.
c. LC-Bead: J-shaped; exposed long flange receives joint compound.
d. L-Bead: L-shaped; exposed long flange receives joint compound.
e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
f. Expansion (control) joint.
g. Curved-Edge Cornerbead: With notched or flexible flanges.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.

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4. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

   a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.
6. .

D. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
2. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Adhesives shall have a VOC content of 50 g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.

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E. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

G. Vapor Retarder: As specified in Section 072600 "Vapor Retarders."

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS

A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

B. Comply with ASTM C 840.

C. Isolate perimeter of gypsum board applied to non load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

D. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

E. Prefill open joints and damaged surface areas.

F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Where indicated on Drawings.
3. Level 3: Where indicated on Drawings.
4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

   a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

5. Level 5: Where indicated on Drawings.

   a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

H. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.

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I. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

J. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.2 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

3.3 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 09 30 13

CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Porcelain tile.
2. Stone thresholds.
3. Waterproof membrane for thinset applications.
4. Metal edge strips.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

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1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Full-size units of each type of trim and accessory.
3. Stone thresholds in 6-inch lengths.
4. Metal edge strips in 6-inch lengths.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

C. Product Certificates: For each type of product, signed by each product manufacturer.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer is a five-star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
3. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.

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1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary coating on exposed surfaces to prevent coated surfaces from contacting backs and edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type and color or finish tile from single source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.

1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
2. Obtain waterproof membrane, except for sheet products, from manufacturer of setting and grouting materials.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Stone thresholds.
2. Waterproof membrane.
3. Metal edge strips.

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2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

2.3 TILE PRODUCTS

A. Ceramic Tile Type T1: Glazed porcelain tile.

1. Manufacturer:

a. Basis of Design: Daltile
b. Mohawk
c. Garden State Tile

2. Certification: Tile certified by the Porcelain Tile Certification Agency.
3. Face Size: 12” x 24”
4. Face Size Variation: Rectified.
5. Thickness: 3/8 inch.
6. Face: As indicated.
7. Dynamic Coefficient of Friction: Not less than 0.42.
8. Tile Color, Glaze, and Pattern: TBD.
9. Grout Color: As selected by Architect from manufacturer's full range.
10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

a. Base Cap: Surface bullnose, module size same as adjoining flat tile.
b. External Corners: Surface bullnose, module size same as adjoining flat tile.
c. Internal Corners: Field-butted square corners.
d. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch across nominal 4-inch dimension.
e. Stair Nosing: Schluter-TREP-SE, Color: GS Black.

B. Ceramic Tile Type T2: Glazed porcelain tile.

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1. Manufacturer:

   a. Basis of Design: Garden State Tile, Metropolis.
   b. Daltile
   c. Mohawk

2. Certification: Tile certified by the Porcelain Tile Certification Agency.
3. Face Size: 4” x 16”
4. Face Size Variation: Rectified.
5. Thickness: 5/16” inch.
6. Face: As indicated.
7. Dynamic Coefficient of Friction: Not less than 0.42.
8. Tile Color, Glaze, and Pattern: Ivory 03.
9. Grout Color: As selected by Architect from manufacturer's full range.
10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

    a. Base Cap: Surface bullnose, module size same as adjoining flat tile.
    b. External Corners: Surface bullnose, module size same as adjoining flat tile.
    c. Internal Corners: Field-butted square corners.
    d. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch across nominal 4-inch dimension.

2.4 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

   1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

B. Marble Thresholds: ASTM C 503/C 503M, with a minimum abrasion resistance of 10 according to ASTM C 1333 or ASTM C 241/C 241M and with honed finish.

   1. Description: As selected by Architect from manufacturer’s full range.

2.5 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Cement Based Waterproofing and Crack Isolation Membrane: Flexible mortar consisting of cement-based mix and latex additive.

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1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. C-Cure; UltraCure 971.
   b. MAPEI Corporation; Mapelastic 315.
   c. TEC; a subsidiary of H. B. Fuller Company; Triple Flex Waterproofing, Crack Isolation Membrane & Mortar.

C. Latex Based Waterproofing and Crack Isolation Membrane: fast setting, flexible, thin, load-bearing, waterproofing membrane system consisting of premixed, quick-drying liquid latex for installation under ceramic tile or complying with ANSI A118.10 and ANSI A118.12, and having IAMPO certification as a shower pan liner.

1. Products: Subject to compliance with requirements, available products may be incorporated into the Work include, but are not limited to, the following:

   a. MAPEI Corporation; Mapelastic AquaDefense

2.6 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set): ISO 13007; C2ES2P2 and ANSI A118.4.

1. Basis of Design Product: Subject to compliance with requirements, provide MAPEI Corporation; Kerabond/Keralastic System or comparable product by one of the following:

   a. Laticrete International, Inc.
   b. TEC; a subsidiary of H. B. Fuller Company.

2. Provide prepackaged dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.7 GROUT MATERIALS

A. Polymer-Modified Tile Grout: ISO 13007; CG2WAF and ANSI A118.7.

1. Basis of Design Product: Subject to compliance with requirements, provide MAPEI Corporation; Ultracolor Plus or comparable product by one of the following:

   a. Laticrete International, Inc.
   b. TEC; a subsidiary of H. B. Fuller Company.

2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

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2.8 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

D. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Custom Building Products.
b. TEC; H.B. Fuller Construction Products Inc.

2.9 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

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a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:

a. Tile floors in wet areas.
b. Tile floors consisting of tiles 8 by 8 inches or larger.
c. Tile floors consisting of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for

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straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Porcelain Tile: 1/4 inch.

G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Manufacturer’s minimum recommended grout width.

H. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in mortar (thinset).
2. Do not extend tile under thresholds set in latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on with elastomeric sealant.

I. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

J. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

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3.5 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.6 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by the manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION

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SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

C. Delegated-Design Submittal: For seismic restraints for ceiling systems.

1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, and coordinated with each other, using input from installers of the items involved.

B. Product test reports.

C. Research reports.

D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Ceiling products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraints for ceiling systems.

C. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

D. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A according to ASTM E 1264.
2. Smoke-Developed Index: 450 or less.

2.2 ACOUSTICAL PANELS - TYPE A1

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Armstrong World Industries, Inc.; Ultima, 1911 HRC

B. Acoustical Panel Standard: Manufacturer's standard panels according to ASTM E 1264.

C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

A. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted, with vinyl overlay on face, back, and sealed edges.
2. Pattern: As indicated by manufacturer's designation..

B. Color: White.

C. Light Reflectance (LR): Not less than 0.89..

D. Ceiling Attenuation Class (CAC): Not less than 0.35.

E. Noise Reduction Coefficient (NRC): Not less than 0.70.

F. Edge/Joint Detail: Tegular.

G. Thickness: 3/4 inch.

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H. Modular Size: 24 by 24 inches.

2.3 ACOUSTICAL PANELS - TYPE A2

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Armstrong World Industries, Inc.; Health Zone Ultima.

B. Acoustical Panel Standard: Manufacturer's standard panels according to ASTM E 1264.

C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

D. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; with vinyl overlay on face, back, and sealed edges.
2. Pattern: As indicated by manufacturer's designation.

E. Color: White.

F. Light Reflectance (LR): Not less than 0.89.

G. Ceiling Attenuation Class (CAC): Not less than 0.35.

H. Noise Reduction Coefficient (NRC): Not less than 0.70.

I. Edge/Joint Detail: Tegular.

J. Thickness: 3/4 inch.

K. Modular Size: 24 by 24 inches.

L. Antimicrobial Treatment: Broad spectrum fungicide and bactericide based.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

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C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
3. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.

E. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

F. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

G. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.

H. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.

I. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

2.5 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Armstrong World Industries, Inc.; Prelude XL 15/16” Exposed Tee.

B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 15/16-inch- wide metal caps on flanges.

1. Structural Classification: Intermediate-duty system.
2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
3. Face Design: Flat, flush.
4. Cap Material: Steel cold-rolled sheet.
5. Cap Finish: Painted white.

2.6 ACOUSTICAL SEALANT

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and effective in reducing

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airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

PART 3 - EXECUTION

3.1 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, unless otherwise indicated.

B. Layout openings for penetrations centered on the penetrating items.

3.2 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.

B. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
3. Arrange directionally patterned acoustical panels as follows:
   a. As indicated on reflected ceiling plans.
   b. Install panels with pattern running in one direction parallel to long axis of space.
   c. Install panels in a basket-weave pattern.

4. Install hold-down clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform inspections.

1. Periodic inspection during the installation of suspended ceiling grids according to ASCE/SEI 7.

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SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient molding accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

C. Samples for Initial Selection: For each type of product indicated.

1. Resilient base: Rubber RB
2. Reducer strip for resilient floor covering.
3. Carpet edge for ¼-inch glue-down applications.
4. Carpet edge for 5/16-inch glue-down applications.
5. Joiner for tile and carpet.
6. Cap for cove carpet 3/16-inch.
7. Cap for cove carpet ¼-inch.
8. Cap for cove resilient floor covering.
9. Trowelable leveling and patching compounds.
10. Concrete slab primer.
11. Adhesives.

D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

E. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

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1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

A. Source Limitations for Resilient Base and Accessories: Obtain each type of resilient base and accessories from a single source with resources to provide materials of consistent quality in appearance and physical properties.

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 THERMOSET-RUBBER BASE : RB-1 & RB-2

A. Manufacturer:

1. Basis of Design – Roppe Corp.

a. Pinnacle Rubber Wall Base.

2. Johnsonite
3. Armstrong

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style and Location:

a. Style B, Cove: Provide in areas with resilient flooring.

C. Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

H. Colors: TBD

2.3 RUBBER MOLDING ACCESSORY

A. Resilient Molding Accessory:
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Reducer Strip for Resilient Floor Covering:

1) Johnsonite; RR-XX-C Reducer.
2) Roppe Corporation, USA; #172 Tile Reducer 1/8 inch.

b. Carpet Edge for ¼-inch Glue-Down Applications:

1) Johnsonite; EG-XX-H Edge Guard.
2) Roppe Corporation, USA; #38 Glue-Down Carpet Edge ¼-inch.

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c. Carpet Edge for 5/16-inch Glue-Down Applications:

1) Johnsonite; EG-XX-G Edge Guard.
2) Roppe Corporation, USA; #39 Glue-Down Carpet Edge 5/16-inch.

d. Joiner for Tile and Carpet:

1) Johnsonite; CTA-XX-A Adapter.
2) Roppe Corporation, USA; #177 Tile Carpet Joiner.

e. Cap for Cove Carpet 3/16-inch:

1) Johnsonite; CCC-XX-D Cove Cap.
2) Roppe Corporation, USA; #161 Carpet Cove Trim.

f. Cap for Cove Carpet ¼-inch:

1) Johnsonite; CCC-XX-C Cove Cap.
2) Roppe Corporation, USA; #158 Cove Cap (Square) ¼-inch.

g. Cap for Cove Resilient Floor Covering:

1) Johnsonite: SCC-XX-B Cove Cap.
2) Roppe Corporation, USA; #165 Cove Cap (Square) 1/8-inch.

B. Material: Vinyl or rubber.

C. Profile and Dimensions: As indicated.

D. Colors and Patterns: As selected by Architect from full range of industry colors.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.

D. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

NOT FOR BIDDING PURPOSES

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

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G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

   a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

   a. Miter corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 09 65 19

RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rubber floor tile.
2. Vinyl composition floor tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.

C. Samples: Full-size units of each color and pattern of floor tile required.

D. Samples for Initial Selection: For each type of floor tile indicated.

E. Samples for Verification: Full-size units of each color and pattern of floor tile required.

F. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

NOT FOR BIDDING PURPOSES

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

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1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 RUBBER FLOOR TILE: RT-1. See finish schedule and finish plan.

A. Manufacturer:

1. Basis of Design – Nora System Inc.

a. Nora Plan Environcare 2.0 mm.
b. Nora Valva 3.0 mm.

2. Tarkett
3. Flexco

B. Tile Standard: ASTM F 1344, Class I-A, homogeneous rubber tile, solid color.

C. Hardness: Manufacturer's standard hardness, measured using Shore, Type A durometer per ASTM D 2240.

D. Wearing Surface: Smooth.

E. Thickness: 2.0 mm.

1. Rt 22a – 3.0 mm.

F. Size: 24 by 24 inches.

G. Colors and Patterns: See Finish Schedule.

2.3 VINYL COMPOSITION FLOOR TILE: VCT 1. See Finish Schedule and Finish Plan.

A. Manufacturer:

1. Basis of Design – Johnsonite. Azrock Collection.
2. Roppe
3. Mannington

B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch.

E. Size: 12 by 12 inches.

F. Colors and Patterns: See Finish Schedule and Finish Plan.

NOT FOR BIDDING PURPOSES

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

C. Floor Polish/Wax: Provide protective, liquid floor-polish products when recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

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C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

E. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain running in one direction.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

I. Seamless Installation:

NOT FOR BIDDING PURPOSES

1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
2. Chemically Bonded Seams: Bond seams with chemical-bonding compound to permanently fuse sections into a seamless flooring. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation and in accordance with manufacturer’s installation guide:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil, with manufacturer’s recommended cleaning equipment.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Finish Coats: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying finish products, in accordance with manufacturer’s installation guide.

1. Vinyl Composite Tile:

a. Finish: Apply 3-5 coats of a recommended floor finish prior to placing the floor into service.

2. Rubber Flooring:

a. Finish per manufacturer’s recommendation.

E. Cover floor tile until Substantial Completion.

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 09 68 13

TILE CARPETING

NOT FOR BIDDING PURPOSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes modular carpet tile.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.
2. Section 096513 "Resilient Base and Accessories" Section 096519 "Resilient Tile Flooring" for resilient wall base and accessories installed with carpet tile.
3. Section 096816 "Sheet Carpeting" for carpet roll goods.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

a. Review delivery, storage, and handling procedures.
b. Review ambient conditions and ventilation procedures.
c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.

3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.

D. Samples for Initial Selection: For each type of carpet tile.

1. Include Samples of exposed edge, transition, and other accessory stripping involving color or finish selection.

E. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.

F. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

G. Sustainable Product Certification: Provide ANSI/NSF 140 certification for carpet products.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

NOT FOR BIDDING PURPOSES

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 Insert number percent of amount installed for each type indicated, but not less than 10 sq. yd..

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II Master II certification level.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups at locations and in sizes shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

1.10 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.

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2. Failures include, but are not limited to, the following:

   a. More than 10 percent edge raveling, snags, and runs.
   b. Dimensional instability.
   c. Excess static discharge.
   d. Loss of tuft-bind strength.
   e. Loss of face fiber.
   f. Delamination.

3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE CPT-1

A. Manufacturer:

   1. Basis of Design: Mohawk

B. Color: Per Finish Schedule.

C. Pattern: Per Finish Schedule.

D. Fiber Type: See Finish Schedule.

E. Pile Characteristic: See Finish Schedule.

F. Pile Thickness: See Finish Schedule.

G. Guage: See Finish Schedule.

H. Primary Backing/Backcoating: Manufacturer's standard composite materials.

I. Secondary Backing: Manufacturer's standard material.

J. Backing System: See Finish Schedule.

K. Applied Treatments:

   1. Soil-Resistance Treatment: Manufacturer's standard treatment.
   2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:

      a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

L. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

NOT FOR BIDDING PURPOSES

M. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

N. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

b. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

NOT FOR BIDDING PURPOSES

D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

I. Access Flooring: Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 09 91 23

INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on interior substrates.

1.3 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Initial Selection: For each type of topcoat product.

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C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. VOC content.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.7 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

NOT FOR BIDDING PURPOSES

1.9 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: P1 – P26. Subject to compliance with requirements, provide products by the following:

1. Basis of Design: Sherwin Williams Company (The).
2. Benjamin Moore.

B. Manufacturer: P27.

1. Basis of Design: Wink on color, by Wolf Gordon. Clear dry erase finish.

C. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

D. Low-Emitting Materials: Exterior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers." Interior Paints and coating must be “Greenguard certified”.

E. Colors: See Finish Schedule for color specifications in Spec Section 090000 “Finish Schedule”.

1. 40 percent of surface area will be painted with deep tones.

2.2 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove

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noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates Contractor's acceptance of surfaces and conditions.

3.2 PREPARATION

A. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

C. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

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D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."
3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Aluminum Substrates: Remove loose surface oxidation.

I. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

J. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

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C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:

a. Equipment, including panelboards and switch gear.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Tanks that do not have factory-applied final finishes.
h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

2. Paint the following work where exposed in occupied spaces:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Other items as directed by Architect.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

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3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 MATERIAL/PAINTING SCHEDULE- INTERIOR WORK:

A. Hollow Metal Doors and Frames, including Glazing Frame

1. 1st Coat

a. Sherwin Williams: Pro Industrial Pro-Cryl Universal Primer B66-310

2. 2nd and 3rd Coats (Semi-gloss)

a. Sherwin Williams: Pro Industrial 0 VOC Acrylic Semi Gloss B66-650

B. Exposed Miscellaneous Metals:

1. 1st Coat

a. Sherwin Williams: Pro Industrial Pro-Cryl Universal Primer B66-310

2. 2nd and 3rd Coats (Semi-gloss)

a. Sherwin Williams: Pro Industrial 0 VOC Acrylic Semi Gloss B66-650

C. Exposed Miscellaneous Metals – Deep tone accent colors:

1. 1st Coat (must use tinted primer)

a. Sherwin Williams: Pro Industrial Pro-Cryl Universal Primer B66-310

2. 2nd and 3rd Coats (Semi-gloss)

a. Sherwin Williams: Pro Industrial 0 VOC Acrylic Semi Gloss B66-650

D. Exposed Galvanized Steel Deck :

1. 1st Coat

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a. Sherwin Williams: Pro Industrial Pro-Cryl Universal Primer B66-310

2. 2nd and 3rd Coats (Semi-gloss)

a. Sherwin Williams: Pro Industrial 0 VOC Acrylic Semi Gloss B66-650

E. Exposed Galvanized Steel Deck - Deep tone accent colors:

1. 1st Coat (must use tinted primer)

a. Sherwin Williams: Pro Industrial Pro-Cryl Universal Primer B66-310

2. 2nd and 3rd Coats (Semi-gloss)

a. Sherwin Williams: Pro Industrial 0 VOC Acrylic Semi Gloss B66-650

F. Exposed Structural Steel and Joists :

1. 1st Coat

a. Sherwin Williams: Pro Industrial Pro-Cryl Universal Primer B66-310

2. 2nd and 3rd Coats (Semi-gloss)

a. Sherwin Williams: Pro Industrial 0 VOC Acrylic Semi Gloss B66-650

G. Exposed Structural Steel and Joists - Deep tone accent colors

1. 1st Coat (must used tinted primer)

a. Sherwin Williams: Pro Industrial Pro-Cryl Universal Primer B66-310

2. 2nd and 3rd Coats (Semi-gloss)

a. Sherwin Williams: Pro Industrial 0 VOC Acrylic Semi Gloss B66-650

H. Galvanized Metal :

1. 1st Coat

a. Sherwin Williams: Pro Industrial Pro-Cryl Universal Primer B66-310

2. 2nd and 3rd Coats (Semi-gloss)

a. Sherwin Williams: Pro Industrial 0 VOC Acrylic Semi Gloss B66-650

I. Opaque Finish Wood , large exposed surfaces:

1. 1st Coat

a. Sherwin Williams: Progreen 200 Interior Latex Primer B28W600

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2. 2nd and 3rd Coats (Semi-gloss)

a. Sherwin Williams: Progreen 200 Interior Latex Semi Gloss B31-600 Series

J. Opaque Finish Wood ,large exposed surfaces- Deep tone accent colors:

1. 1st Coat (must use tinted primer, certain colors may require more than 2 finish coats)

a. Sherwin Williams: Progreen 200 Interior Latex Primer B28W600

2. 2nd and 3rd Coats (Semi-gloss)

a. Sherwin Williams: Progreen 200 Interior Latex Semi Gloss B31-600 Series

K. Opaque Finish Wood - narrow recesses, blocking and supports:

1. 1st Coat

a. Sherwin Williams: Progreen 200 Interior Latex Primer B28W600

2. 2nd and 3rd Coats (Semi-gloss)

a. Sherwin Williams: Progreen 200 Interior Latex Semi Gloss B31-600 Series

L. Gypsum Board:

1. 1st Coat

a. Sherwin Williams: Progreen 200 Interior Latex Primer B28W600

2. 2nd and 3rd Coats (Eggshell)

a. Sherwin Williams: Progreen 200 Interior Latex Eg-Shel B20-600 Series

M. Gypsum Board – Deep tone accent color:

1. 1st Coat (must use tinted primer, more than 2 finish coats may be required)

a. Sherwin Williams: Progreen 200 Interior Latex Primer B28W600

2. 2nd and 3rd Coats (Eggshell)

a. Sherwin Williams: Progreen 200 Interior Latex Eg-Shel B20-600 Series

N. Gypsum Board – Corridors, Toilets and Locker Rooms :

1. 1st Coat

a. Sherwin Williams: Progreen 200 Interior Latex Primer B28W600

2. 2nd and 3rd Coats (Eggshell)

NOT FOR BIDDING PURPOSES

a. Sherwin Williams: Progreen 200 Interior Latex Eg-Shel B20-600 Series

O. Block Skim Coat:

a. Sherwin Williams: Cement-Plex 875

Provide 1st, 2nd and 3rd coat as per manufacture recommendation.

P. Concrete Masonry Units:

1. 1st Coat

a. Sherwin Williams: PrepRite Block Filler B25W25

2. 2nd and 3rd Coats (Semi-gloss)

a. Sherwin Williams: Progreen 200 Interior Latex Semi Gloss B31-600 Series

Q. Concrete Masonry Units-Lobby C101 & Main Corridor C115:

1. 1st Coat

a. Sherwin Williams: Waterborne Amine Epoxy Primer, per manufacturer's recommendations.

2. 2nd and 3rd Coats (Semi-gloss)

a. Sherwin Williams: Waterborne Amine Expoxy.

R. Concrete Masonry Units– Deep tone accent colors:

1. 1st Coat (must use tinted primer, more than 2 finish coats may be required)

a. Sherwin Williams: PrepRite Block Filler B25W25

2. 2nd and 3rd Coats (Semi-gloss)

a. Sherwin Williams: Progreen 200 Interior Latex Semi Gloss B31-600 Series

S. Concrete Masonry Units– Corridor, Toilets and Locker Rooms:

1. 1st Coat

a. Sherwin Williams: PrepRite Block Filler B25W25

2. 2nd and 3rd Coats (Semi-gloss)

a. Sherwin Williams: Progreen 200 Interior Latex Semi Gloss B31-600 Series

T. Concrete – not intended for floors:

NOT FOR BIDDING PURPOSES

1. 1st Coat

   a. Sherwin Williams: PrepRite Block Filler B25W25

2. 2nd and 3rd Coats (Semi-gloss)

   a. Sherwin Williams: Progreen 200 Interior Latex Semi Gloss B31-600 Series

U. Concrete – Deep tone accent colors, not intended for floors:

1. 1st Coat (must use tinted primer, more than 2 finish coats may be required)

   a. Sherwin Williams: PrepRite Block Filler B25W25

2. 2nd and 3rd Coats (Semi-gloss)

   a. Sherwin Williams: Progreen 200 Interior Latex Semi Gloss B31-600 Series

V. Pipe Covering:

1. 1st Coat

   a. Sherwin Williams: Pro Industrial Pro-Cryl Universal Primer B66-310

2. 2nd and 3rd Coats (Semi-gloss)

   a. Sherwin Williams: Progreen 200 Interior Latex Semi Gloss B31-600 Series

W. Pipe Covering – Deep tone accent colors:

1. 1st Coat (must use tinted primer, more than 2 finish coats may be required)

   a. Sherwin Williams: Pro Industrial Pro-Cryl Universal Primer B66-310

2. 2nd and 3rd Coats (Semi-gloss)

   a. Sherwin Williams: Pro Industrial 0 VOC Acrylic Semi-Gloss B66-650 Series

X. Pipe Supports and Hangers:

1. 1st Coat

   a. Sherwin Williams: Pro Industrial Pro-Cryl Universal Primer B66-310

2. 2nd and 3rd Coats (Eggshell)

   a. Sherwin Williams: Pro Industrial 0 VOC Acrylic Semi-Gloss B66-650 Series

Y. Aluminum:

1. 1st Coat

NOT FOR BIDDING PURPOSES

a. Sherwin Williams: Pro Industrial Pro-Cryl Universal Primer B66-310

2. 2nd and 3rd Coats (Eggshell)

a. Sherwin Williams: Pro Industrial 0 VOC Acrylic Semi-Gloss B66-650 Series

Z. Steel piping:

1. 1st Coat

a. Sherwin Williams: Pro Industrial Pro-Cryl Universal Primer B66-310

2. 2nd and 3rd (Eggshell)

a. Sherwin Williams: Pro Industrial 0 VOC Acrylic Semi-Gloss B66-650 Series

AA. Stained Wood- closed or open grain:

1. 1st Coat

a. Sherwin Williams: Wood Classics Interior Oil Stain (Quart size only – OTC)

2. 2nd and 3rd Coats (Eggshell/Low Lustre)

a. Sherwin Williams: Wood Classics Waterborne Polyurethane Varnish Satin A68F90

BB. Clear Finish Wood- closed grain:

1. 1st Coat

a. Sherwin Williams: Wood Classics Waterborne Polyurethane Varnish Satin A68F90

2. 2nd and 3rd Coats (Satin/Low Lustre)

a. Sherwin Williams: Wood Classics Waterborne Polyurethane Varnish Satin A68F90

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 10 14 00

INTERIOR SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Room identification sign system.
2. Signage accessories.
3. Signage Schedule.

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals (except Samples for Verification) and informational submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Data: Submit manufacturer's technical data and installation instructions for each type of sign required, including construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.

C. Shop Drawings: Submit shop drawings for fabrication and erection of interior signs, including plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, mounting heights, layout, spacing, reinforcement, accessories, and installation details. Shop drawings are to including but not limited to:

1. Message list for each sign.
2. Large-scale details of wording, lettering artwork and Braille layout.
3. Complete color list – both standard and custom colors.
4. Photocopies of Tetra Tech documentation not acceptable.
5. Fasteners and anchors.

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6. Signage Schedule.
7. Adhesives.
8. Two-face tape.

D. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

E. Samples for Verification: For each type of sign assembly showing all components and with the required finishes, in manufacturer's standard size unless otherwise indicated and as follows:

1. Panel Signs: Full-size Sample.
2. Field-Applied, Vinyl-Character Signs: Full-size Sample of characters on glass.

F. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

G. Sample Warranty: For special warranty.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

B. Warranty: Executed special warranty.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Qualifications

a. Manufacturer: Obtain each sign type and all associated accessories through one source from single manufacturer.
b. Installer: Workers to be approved by signage manufacturer and supply list of recently completed installations.

2. Regulatory Requirements

a. ADA Compliance: Comply with the Americans with Disabilities Act (ADA), and with code provisions as adopted by authorities having jurisdiction.

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1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration of graphic image.
c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities, ICC A117.1, and building code in effect for Project, for signs.

B. Fire Rating: Provide sign material with Class 1A fire rating.

2.2 SIGNS

A. Basis-of-Design Product: For convenience detail and specifications have been based on "InForm" by ASI Signage Systems, Grand Island, New York. Other manufactures offering comparable product by one of the following:

1. Andco Industries Corp.; Greensboro, North Carolina
2. Mohawk Engraving Co.; Schenectady, New York
3. Best Sign Systems Inc.

PART 3 - ROOM IDENTIFICATION SIGN SYSTEM

A. Material: Metal – Embossed aluminum.
1. Sign Face: Encapsulated poly-carbonate layer chemically bonded to 1/16" one piece aluminum substrate with painted edges.
2. Tactile Graphics and Text: Integral to face.
3. Finish: Selected by Architect from manufacturer's full range of standard and custom non-glare finishes.
4. Contrast: Selected by Architect from dark characters on light background or light characters on dark background.
5. Similar to "InForm" by ASI Sign Systems

B. Interior Signage Types: Not all types may be applicable for project. Refer to Signage Schedule for specific text and quantities:

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1. Type 5: Room Name/Number Sign: 6"x6" sign.

   a. Text: All room numbers printed in minimum 1" high sans serif lettering and two lines, where needed. All room names printed in minimum 5/8" high lettering.

2. Type 7: Room Sign: 2"x6" sign.

   a. Text: All room names printed in minimum 5/8" high lettering.

3. Type 10: Restroom Sign: 6"x6" sign.

   a. Graphics: Male/female symbol and wheelchair accessibility symbol, if applicable.
   b. Use with Room Sign (Type 7).

3.2 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Provide inserts, as required, to be set into concrete or masonry work.

B. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

   1. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
   2. Exposed Metal-Fastener Components: General:

      a. Fastener Heads: For nonstructural connections, use flathead or oval counter sunk screws and bolts with tamper-resistant Allen-head spanner-head or one-way-head slots unless otherwise indicated.

C. Adhesives: As recommended by sign manufacturer and with a VOC content 4 g/L or less for adhesives used inside the weatherproofing system and applied on-site when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

3.3 FABRICATION

A. Fabrication: Comply with requirements of The Americans Disabilities Act (ADA) of 1990 and dimensions and characteristic given below and in ‘Interior Signage Types’.
   1. Braille Characters: Grade 2 Braille (literary Braille) consisting of 189 part words or whole word contractions, in addition to 63 Grade 1 Braille characters.
   2. Character Height (based on upper case): 5/8-inch minimum; 3 inches maximum.
   3. Tactile Characters: Raised 1/32-inch minimum thickness.
   4. Type Style: All upper case letters, without serifs or with simple serifs.
   5. Symbols: Provide border around symbol (not required to be raised) with verbal description placed directly below symbol in 1/32 inch raised and Braille characters.

NOT FOR BIDDING PURPOSES

6. Color: Up to 5 colors throughout school, as selected by Architect from manufacturer's full color range.

B. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

3.4 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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.

PART 4 - EXECUTION

4.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Beginning installation constitutes Contractor's acceptance of substrates and conditions.

4.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Mounting Locations: Walls adjacent to latch side of door 60 inches from center of sign to finished floor, and 2 inches from edge of doorframe. Where wall space adjacent to latch side of door is not available, and at double leaf doors, place sign on nearest adjacent wall.

C. Mounting Methods:

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1. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
   a. Vinyl-Tape Mounting (Semi-Permanent Installations): Double sided tape to mount signs to smooth, non-porous surfaces. Not suitable for rough, or vinyl covered surfaces.
   b. Silicone Adhesive: To be used with Vinyl Tape. Suitable for most wall surfaces including vinyl. Provide adhesive as recommended by sign manufacturer.

4.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

PART 5 - SIGN SCHEDULES

A. All permanent rooms to receive room identification system containing both text and room numbers.

B. Provide barrier-free and tactile signage at all locations required by code and as shown on the architectural drawings.

C. Coordinate mounting heights as per CABO/ANSI A117.1 and as per manufacturer’s recommendations.

D. All room names and numbers are subject to change, Supplier to verify with school district during construction phase, prior to submittal phase, for final room names and numbers.

E. All colors to be issued during construction.

COLOR	ROOM NO.	SIGNAGE TYPE	SIGNAGE TEXT	*REMARKS*
			FIRST FLOOR	
	100	5	Room Name to be provided by district	TYPE 5 AT ALL DOORS EXCEPT Restroom 103
	Unisex Restroom 103	5	Room Name to be provided by district	

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 10 28 00

TOILET ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Toilet Room accessories.
2. Shower accessories.
3. Private-use bathroom accessories.
4. Underlavatory guards.
5. Custodial accessories.

1.3 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

B. Samples: Full size, for each exposed product and for each finish specified.

1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

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1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.7 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: Fifteen (15) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED MATERIALS

A. Owner-Furnished Materials:

1. Soap Dispenser.
2. Toilet Paper Dispenser.
3. Paper Towel Dispenser.

2.2 PERFORMANCE REQUIREMENTS

A. 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.

2.3 TOILET ROOM ACCESSORIES

A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

B. Waste Receptacle:

1. Product: As indicated on Drawing A-401

C. Grab Bar:

NOT FOR BIDDING PURPOSES

1. Product: As indicated on Drawing A-401.

D. Sanitary-Napkin Disposal Unit:

1. Product: As indicated on Drawing A-401.

E. Mirror Unit:

1. Product: As indicated on Drawing A-401.

F. Coat Hook:

1. Product: As indicated on Drawing A-401.

2.4 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.5 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

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PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION

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SECTION 10 44 13

FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for the following:

a. Portable fire extinguisher.

B. Related Requirements:

1. Section 10 44 16 "Fire Extinguishers" for portable, hand-carried fire extinguishers accommodated by fire-protection cabinets

1.3 PREINSTALLATION CONFERENCE

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to fire-protection cabinets, including, but not limited to, the following:

a. Schedules and coordination requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
2. Show location of knockouts for hose valves.

B. Shop Drawings: For fire-protection cabinets.

1. Include plans, elevations, sections, details, and attachments to other work.

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C. Samples: For each type of exposed finish required.

D. Samples for Initial Selection: For each type of exposed finish required.

E. Samples for Verification: For each type of exposed finish required, prepared on samples 6 by 6 inches square.

F. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.6 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain fire-protection cabinets, accessories, and fire extinguishers from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

B. 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.

2.3 FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. JL Industries, Inc.; a division of the Activar Construction Products Group.
b. Larsens Manufacturing Company.

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c. Potter Roemer LLC.

B. Cabinet Construction: Nonrated.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch-thick cold-rolled steel sheet lined with minimum 5/8-inch-thick fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Cold-rolled steel sheet.

1. Shelf: Same metal and finish as cabinet.

D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
2. Rolled-Edge Trim: 2-1/2-inch backbend depth.

E. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.

F. Cabinet Trim Material: Same material and finish as door.

G. Door Material: Steel sheet.

H. Door Style: Fully glazed panel with frame.

I. Door Glazing: Tempered float glass (clear).

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide manufacturer's standard.
2. Provide manufacturer's standard hinge, permitting door to open 180 degrees.

K. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.

a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER." Letting Color and orientation as directed by Architect.

L. Materials:

1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

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a. Finish: Factory primed for field painting.
b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
c. Color: As selected by Architect from manufacturer's full range.

2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.4 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Miter corners and grind smooth.
3. Provide factory-drilled mounting holes.
4. Prepare doors and frames to receive locks.
5. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Fabricate door frames of one-piece construction with edges flanged.
3. Miter and weld perimeter door frames and grind smooth.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. 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.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated

1. Fire-Protection Cabinets: 42 inches above finished floor to top of fire extinguisher.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
4. Fire-Rated Cabinets:

a. Install cabinet with not more than 1/16-inch tolerance between pipe OD and knockout OD. Center pipe within knockout.
b. Seal through penetrations with firestopping sealant as specified in Section 07 84 13 "Penetration Firestopping."

C. Identification:

1. Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

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D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

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SECTION 10 44 16

FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes portable, hand-carried fire extinguishers.

B. Related Requirements:

1. Section 10 44 13 "Fire Protection Cabinets."
2. Section 23 38 13 "Commercial-Kitchen Hoods" for fire-extinguishing systems provided as part of commercial-kitchen exhaust hoods.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:

a. Schedules and coordination requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.

B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function.

1.5 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

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1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.7 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Amerex Corporation.
b. Ansul Incorporated; Tyco International.
c. Badger Fire Protection.
d. Buckeye Fire Equipment Company.
e. Fire End & Croker Corporation.

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f. JL Industries, Inc.; a division of the Activar Construction Products Group.
g. Larsens Manufacturing Company.
h. Potter Roemer LLC.
i. Pyro-Chem; Tyco Fire Suppression & Building Products.

2. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories from single source from single manufacturer.
3. Valves: Manufacturer's standard.
4. Handles and Levers: Manufacturer's standard.
5. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

2.3 MOUNTING BRACKETS

A. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: Top of fire extinguisher to be at 42 inches above finished floor.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION

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SECTION 12 24 13

ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified, 10 inches long.

D. Samples for Initial Selection: For each type and color of shadeband material.

1. Include Samples of accessories involving color selection.

E. Samples for Verification: For each type of roller shade.

1. Shadeband Material: Not less than 10 inches square. Mark interior face of material if applicable.
2. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
3. Installation Accessories: Full-size unit, not less than 10 inches long.

F. Product Schedule: For roller shades. Use same designations indicated on Drawings.

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1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material.

C. Product Test Reports: For each type of shadeband material, for tests performed by manufacturer and witnessed by a qualified testing agency a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate

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measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Basis of Desgin: Mecho/5 by Mecho Systems

B. Chain-and-Clutch Operating Mechanisms: With continuous loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Manufacturer's standard Stainless steel.

   a. Loop Length: Full length of roller shade.
   b. Limit Stops: Provide upper and lower ball stops.
   c. Chain-Retainer Type: Clip, jamb mount.

2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.

   a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criterion is more stringent.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of interior face of shade.
2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

F. Shadebands:

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1. Shadeband Material: Light-filtering fabric. Basis of Design: Mecho Systems Thermoveil 1500 Series (3% open)
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

   a. Type: Enclosed in sealed pocket of shadeband material.
   b. Color and Finish: As selected by Architect from manufacturer's full range.

G. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

   a. Shape: L-shaped.
   b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 4 inches.

2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.

   a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than 4 inches.

3. Endcap Covers: To cover exposed endcaps.

4. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.

   a. Closure-Panel Width: 2 inches.

5. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Source: Roller shade manufacturer.
2. Type: PVC-coated polyester.
3. Weave: Basketweave.
4. Roll Width: Provide width that maximizes roll without vert. seams at any window.
5. Orientation on Shadeband: Up the bolt.
6. Openness Factor: 3 percent.
7. Color: As selected by Architect from manufacturer's full range.

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2.4 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances,and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

C. Roller Shade Locations: At exterior windows and As indicated on Drawings.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

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B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 12 36 23.13

PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes plastic-laminate countertops.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products, and high-pressure decorative laminate.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, electrical switches and outlets, and other items installed in plastic-laminate countertops.
2. Apply WI Certified Compliance Program label to Shop Drawings.
3. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples for Initial Selection:

1. Plastic laminates.

D. Samples for Verification:

1. Plastic laminates, 8 by 10 inches, for each color, pattern, and surface finish.
2. Wood-grain plastic laminates, 12 by 24 inches, for each pattern and surface finish.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer fabricator.

B. Product Certificates: For each type of product the following:

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1. Composite wood and agrifiber products.
2. High-pressure decorative laminate.
3. Chemical-resistant, high-pressure decorative laminate.
4. Adhesives.

C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates WI Certified Compliance Program certificates.

D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program. Shop is a licensee of WI's Certified Compliance Program.

B. Installer Qualifications: Fabricator of products Certified participant in AWI's Quality Certification Program Licensee of WI's Certified Compliance Program.

C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas. If countertops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

C. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

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D. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.

1. Provide labels and certificates from AWI WI certification program indicating that countertops, including installation, comply with requirements of grades specified.
2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Premium.

C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Basis of Design: Wilsonart.
b. Formica Corporation.
c. Pionite; a Panolam Industries International, Inc. brand.

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As indicated on Finish Schedule & Millwork Details.

2. Grain Direction: Parallel to cabinet fronts.

E. Edge Treatment: 3MM PVC edge banding, selected from a minimum of 12 colors. 3MM PVC to be solid, high impact, purified, color-thru, acid resistant, pre-lamination primed edging, machine-applied with hot melt adhesives, automatically trimmed, inside/outside length-radiused for uniform appearance, buffed and corner-radiused for consistent design.

F. Core Material: Particleboard or medium-density fiberboard.

G. Core Material at Sinks: medium-density fiberboard made with exterior glue or exterior-grade plywood.

H. Core Thickness: 3/4 inch.

1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.

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I. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

J. Paper Backing: Provide paper backing on underside of countertop substrate.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard, unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard: ANSI A208.2, Grade 130 .
2. Particleboard: ANSI A208.1, Grade M-2.

3. Softwood Plywood: DOC PS 1.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

1. Use treated materials that comply with requirements of referenced woodworking standard. Do not use materials that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
2. For items indicated to receive a stained or natural finish, use organic resin chemical formulation.
3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking shop certified by testing and inspecting agency.

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4. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.

1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
2. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.

3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Flakeboard Company Limited.
b. SierraPine.

2.4 ACCESSORIES

A. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Doug Mockett & Company, Inc.

2.5 MISCELLANEOUS MATERIALS

A. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.6 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:

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1. Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.

C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

D. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.

1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
2. Seal edges of cutouts by saturating with varnish.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches.

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Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

F. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean countertops on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

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SECTION 13 34 19

METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Structural-steel framing.

2. Foamed-insulation-core metal roof panels.
3. Foamed-insulation-core metal wall panels.
4. Metal soffit panels.
5. Accessories.

B. Related Requirements:

1. Section 07 72 53 "Snow Guards" for prefabricated devices designed to hold snow on the roof surface.
2. Section 08 33 23 "Overhead Coiling Doors" for coiling vehicular doors in metal building systems.

1.3 DEFINITIONS

A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in standards referenced by this Section.

1.4 COORDINATION

A. Coordinate sizes and locations of concrete foundations and casting of anchor-rod inserts into foundation walls and footings. Anchor rod installation, concrete, reinforcement, and formwork requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."

B. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

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1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to metal building systems including, but not limited to, the following:

   a. Condition of foundations and other preparatory work performed by other trades.
   b. Structural load limitations.
   c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
   d. Required tests, inspections, and certifications.
   e. Unfavorable weather and forecasted weather conditions and impact on construction schedule.

2. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:

   a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
   b. Structural limitations of purlins and rafters during and after roofing.
   c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
   d. Temporary protection requirements for metal roof panel assembly during and after installation.
   e. Roof observation and repair after metal roof panel installation.

3. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:

   a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
   b. Structural limitations of girts and columns during and after wall panel installation.
   c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
   d. Temporary protection requirements for metal wall panel assembly during and after installation.
   e. Wall observation and repair after metal wall panel installation.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of metal building system component.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

   a. Metal roof panels.
   b. Metal wall panels.
   c. Foamed-insulation-core metal panels.
   d. Metal soffit panels.

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e. Thermal insulation and vapor-retarder facings.
f. Personnel doors and frames.
g. Windows.
h. Translucent roof panels.
i. Roof ventilators.
j. Louvers.

B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details and the following:

1. Anchor-Rod Plans: Submit anchor-rod plans and templates before foundation work begins. Include location, diameter, and minimum required projection of anchor rods required to attach metal building to foundation. Indicate column reactions at each location.
2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.

   a. Show provisions for attaching pipe racks.

3. Metal Roof and Wall Panel Layout Drawings: Show layouts of panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, clip spacing, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.

   a. Show roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, and items mounted on roof curbs.
   b. Show wall-mounted items including personnel doors, vehicular doors, windows, louvers, and lighting fixtures.
   c. Show translucent panels.

4. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:

   a. Flashing and trim.
   b. Gutters.
   c. Downspouts.
   d. Service walkways.

C. Samples for Initial Selection: For units with factory-applied finishes.

D. Samples for Verification: For the following products:

1. Panels: Nominal 12 inches long by actual panel width. Include fasteners, closures, and other exposed panel accessories.
2. Flashing and Trim: Nominal 12 inches long. Include fasteners and other exposed accessories.
3. Vapor-Retarder Facings: Nominal 6-inch-square Samples.
4. Windows: Full-size, nominal 12-inch-long frame Samples showing typical profile.
5. Accessories: Nominal 12-inch-long Samples for each type of accessory.

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E. Door Schedule: For doors and frames. Use same designations indicated on Drawings. Include details of reinforcement.

1. Door Hardware Schedule: Include details of fabrication and assembly of door hardware. Organize schedule into door hardware sets indicating complete designations of every item required for each door or opening.
2. Keying Schedule: Detail Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

F. Delegated-Design Submittal: For metal building systems.

1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer, registered in the State where the building will be erected, responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For erector.

B. Welding certificates.

C. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:

1. Name and location of Project.
2. Order number.
3. Name of manufacturer.
4. Name of Contractor.
5. Building dimensions including width, length, height, and roof slope.
6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
7. Governing building code and year of edition.
8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure and seismic design category or effective peak velocity-related acceleration/peak acceleration.
9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
10. Building-Use Category: Indicate category of building use and its effect on load importance factors.

D. Erector Certificates: For qualified erector, from manufacturer.

E. Material Test Reports: For each of the following products:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shop primers.
5. Nonshrink grout.

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F. Source quality-control reports.

G. Field quality-control reports.

H. Surveys: Show final elevations and locations of major members. Indicate discrepancies between actual installation and the Contract Documents. Have surveyor who performed surveys certify their accuracy.

I. Sample Warranties: For special warranties.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panel finishes and door hardware to include in maintenance manuals.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer.

1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."
2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.

B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

D. Land Surveyor Qualifications: A professional land surveyor who practices in jurisdiction where Project is located and who is experienced in providing surveying services of the kind indicated.

E. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for typical wall metal panel including accessories.

   a. Size: 48 inches long by 48 inches.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

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1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Protect foam-plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
3. Complete installation and concealment of foam-plastic materials as rapidly as possible in each area of construction.

1.11 FIELD CONDITIONS

A. Weather Limitations: Proceed with panel installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

1.12 WARRANTY

A. Special Warranty on Metal Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 25 years from date of Substantial Completion.

B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

2.2 SYSTEM DESCRIPTION

A. Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.

B. Primary-Frame Type:

1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.

C. End-Wall Framing: Manufacturer's standard, for buildings not required to be expandable, consisting of primary frame, capable of supporting one-half of a bay design load, and end-wall columns.

D. Secondary-Frame Type: Manufacturer's standard purlins and joists and flush-framed exterior-framed (bypass) girts.

E. Eave Height: As indicated on Drawings.

F. Bay Spacing: As indicated on Drawings.

G. Roof Slope: 1/2 inch per 12 inches.

H. Roof System: Manufacturer's standard standing-seam, vertical-rib, foamed-insulation-core metal roof panels.

I. Exterior Wall System: Manufacturer's standard concealed-fastener, flush-profile, foamed-insulation-core metal wall panels.

2.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design metal building system.

B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."

1. Design Loads: As indicated on Drawings.
2. Deflection and Drift Limits: Design metal building system assemblies to withstand serviceability design loads without exceeding deflections and drift limits recommended in

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AISC Steel Design Guide No. 3 "Serviceability Design Considerations for Steel Buildings."

3. Deflection and Drift Limits: No greater than the following:

   a. Purlins and Rafters: Vertical deflection of 1/240 of the span.
   b. Girts: Horizontal deflection of 1/240 of the span.
   c. Metal Roof Panels: Vertical deflection of 1/240 of the span.
   d. Metal Wall Panels: Horizontal deflection of 1/240 of the span.
   e. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
   f. Lateral Drift: Maximum of 1/200 of the building height.

C. Seismic Performance: Metal building system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

E. Fire-Resistance Ratings: Where assemblies are indicated to have a fire-resistance rating, provide metal panel assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 or ASTM E 108 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

   1. Indicate design designations from UL's "Fire Resistance Directory," FM Global's "Approval Guide," or from the listings of another qualified testing agency.

F. Fire Propagation Characteristics: Exterior wall assemblies containing foam plastics pass NFPA 285 fire test.

G. 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 positive pressure according to NFPA 252 or UL 10C.

   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.

H. Structural Performance for Metal Roof and Wall Panels: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

   1. Wind Loads: As indicated on Drawings.

I. Air Infiltration for Metal Roof Panels: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 1680 at the following test-pressure difference:

   1. Test-Pressure Difference: 1.57 lbf/sq. ft..

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J. Air Infiltration for Metal Wall Panels: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft..

K. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft..

L. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft..

M. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

N. Energy Star Listing: Roof panels that are listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

O. Energy Performance: Provide roof panels according to one of the following when tested according to CRRC-1:

1. Three-year, aged, Solar Reflectance Index of not less than 64 when calculated according to ASTM E 1980.

P. Thermal Performance for Opaque Elements: Provide the following maximum U-factors and minimum R-values when tested according to ASTM C 1363 or ASTM C 518:

1. Roof:
   a. R-Value: 30 min.

2. Walls:
   a. R-Value: 26 min.

2.4 STRUCTURAL-STEEL FRAMING

A. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."

B. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

C. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

D. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to

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frames; rafters, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.

1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.

   a. Slight variations in span and spacing may be acceptable if necessary to comply with manufacturer's standard, as approved by Architect.

2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
3. Frame Configuration: One-directional, sloped.
4. Exterior Column: Uniform depth.
5. Rafter: Tapered.

E. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:

1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet.
2. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; or I-shaped sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.

F. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating, to comply with the following:

1. Purlins: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; minimum 2-1/2-inch-wide flanges.

   a. Depth: As indicated on Drawings.

2. Purlins: Steel joists of depths indicated on Drawings.
3. Girts: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees from flange, with minimum 2-1/2-inch-wide flanges.

   a. Depth: As indicated on Drawings.

4. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.
5. Flange Bracing: Minimum 2-by-2-by-1/8-inch structural-steel angles or 1-inch-diameter, cold-formed structural tubing to stiffen primary-frame flanges.
6. Sag Bracing: Minimum 1-by-1-by-1/8-inch structural-steel angles.
7. Base or Sill Angles: Manufacturer's standard base angle, minimum 3-by-2-inch, fabricated from zinc-coated (galvanized) steel sheet.
8. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.

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9. Framing for Openings: Channel shapes; fabricated from cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings and head, jamb, and sill of other openings.
10. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.

G. Canopy Framing: Manufacturer's standard structural-framing system, designed to withstand required loads; fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide frames with attachment plates and splice members, factory drilled for field-bolted assembly.

1. Type: Purlin-extension type.

H. Bracing: Provide adjustable lateral bracing using any method as follows. All bracing shall be concealed within architectural wall and ceiling systems.

1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50; or ASTM A 529/A 529M, Grade 50; minimum 1/2-inch-diameter steel; threaded full length or threaded a minimum of 6 inches at each end.
2. Cable: ASTM A 475, minimum 1/4-inch-diameter, extra-high-strength grade, Class B, zinc-coated, seven-strand steel; with threaded end anchors.
3. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.
4. Rigid Portal Frames: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
5. Diaphragm Action of Metal Panels: Design metal building to resist wind forces through diaphragm action of metal panels.

I. Anchor Rods: Headed anchor rods as indicated in Anchor Rod Plan for attachment of metal building to foundation.

J. Materials:

1. W-Shapes: ASTM A 992/A 992M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
3. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
4. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
5. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade C, structural tubing.
6. Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55, or High-Strength Low-Alloy Steel (HSLAS) or High-Strength Low-Alloy Steel with Improved Formability (HSLAS-F), Grades 45 through 70; or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80, or HSLAS, Grades 45 through 70.
7. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, SS, Grades 33 through 80, or HSLAS or HSLAS-F, Grades 50 through 80; with G60 coating designation; mill phosphatized.

NOT FOR BIDDING PURPOSES

8. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

   a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, SS, Grades 33 through 80, or HSLAS or HSLAS-F, Grades 50 through 80; with G90 coating designation.
   b. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, SS, Grade 50 or 80; with Class AZ50 coating.

9. Steel Joists: Manufactured according to "Standard Specifications for Open Web Steel Joists, K-Series," in SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders"; with steel-angle, top- and bottom-chord members, and end- and top-chord arrangements as indicated on Drawings and required for secondary framing.

10. Structural Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563 heavy-hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

    a. Finish: Hot-dip zinc coating, ASTM F 2329, Class C.

11. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts; ASTM A 563 heavy-hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers, plain.

12. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex-head steel structural bolts with spline ends.

    a. Finish: Mechanically deposited zinc coating, ASTM B 695, Class 50.

13. Headed Anchor Rods: ASTM F 1554, Grade 55.

    a. Configuration: Straight.
    b. Nuts: ASTM A 563 heavy-hex carbon steel.
    c. Plate Washers: ASTM A 36/A 36M carbon steel.
    d. Washers: ASTM F 436 hardened carbon steel.
    e. Finish: Hot-dip zinc coating, ASTM F 2329, Class C.

14. Threaded Rods: ASTM A 572/A 572M, Grade 50.

    a. Nuts: ASTM A 563 heavy-hex carbon steel.
    b. Washers: ASTM F 436 hardened carbon steel.
    c. Finish: Hot-dip zinc coating, ASTM F 2329, Class C.

K. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.

1. Clean and prepare in accordance with SSPC-SP2.
2. Coat with manufacturer's standard primer. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil.

NOT FOR BIDDING PURPOSES

a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil on each side.

2.5 FOAMED-INSULATION-CORE METAL ROOF PANELS

A. Concealed-Fastener, Foamed-Insulation-Core Metal Roof Panels (RS-2) Formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.

1. Basis of Design: MBCI, Insulated BattenLok.

2. Panel Thermal-Resistance Value (R-Value): 26 min.
3. Facing Material: Fabricate panel with exterior and interior facings of same material and thickness. Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024 gage nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

   a. Exterior Surface: Smooth, flat.
   b. Exterior Finish: Two-coat fluoropolymer.
   c. Color: As selected by Architect from manufacturer's full range.

4. Panel Coverage: 42 inches nominal.
5. Panel Thickness: 3 inches.
6. Insulation Core: Modified polyisocyanurate or polyurethane foam using a non-CFC blowing agent, foamed-in-place or board type, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.

   a. Closed-Cell Content: 90 percent when tested according to ASTM D 6226.
   b. Density: 2.0 to 2.6 lb/cu. ft. when tested according to ASTM D 1622.
   c. Compressive Strength: Minimum 20 psi when tested according to ASTM D 1621.
   d. Shear Strength: 20 psi when tested according to ASTM C 273/C 273M.

7. Fire-Test-Response Characteristics: Class A according to ASTM E 108.
8. Surface Burning Characteristics: Flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E 84.

B. Finishes:

1. Exposed Coil-Coated Finish:

   a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   b. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

NOT FOR BIDDING PURPOSES

c. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a minimum dry film thickness of 0.2 mil for primer and 0.8 mil for topcoat.

2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.6 FOAMED-INSULATION-CORE METAL WALL PANELS

A. Concealed-Fastener, Foamed-Insulation-Core Metal Roof Panels (RS-2) Formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.

1. Basis of Design: MBCI, CF Mesa

2. Panel Thermal-Resistance Value (R-Value): 24 min.
3. Facing Material: Fabricate panel with exterior and interior facings of same material and thickness. Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024 inches nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

   a. Exterior Surface: Stucco-embossed, Mesa Profile.
   b. Exterior Finish: Two-coat fluoropolymer.
   c. Color: As selected by Architect from manufacturer's full range.

4. Panel Coverage: 36 inches nominal.
5. Panel Thickness: 2 inches.
6. Insulation Core: Modified polyisocyanurate or polyurethane foam using a non-CFC blowing agent, foamed-in-place or board type, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.

   a. Closed-Cell Content: 90 percent when tested according to ASTM D 6226.
   b. Density: 2.0 to 2.6 lb/cu. ft. when tested according to ASTM D 1622.
   c. Compressive Strength: Minimum 20 psi when tested according to ASTM D 1621.
   d. Shear Strength: 26 psi when tested according to ASTM C 273/C 273M.

7. Fire-Test-Response Characteristics: Class A according to ASTM E 108.
8. Surface-Burning Characteristics: Flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E 84.

B. Finishes:

1. Exposed Coil-Coated Finish:

   a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

NOT FOR BIDDING PURPOSES

b. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

c. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a minimum dry film thickness of 0.2 mil for primer and 0.8 mil for topcoat.

2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.7 METAL SOFFIT PANELS

A. General: Provide factory-formed metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.

B. Metal Soffit Panels: Match profile and material of metal roof panels.

1. Finish: Match finish and color of metal roof panels.

C. Concealed-Fastener, Flush-Profile, Metal Soffit Panels: Formed with vertical panel edges and flush surface; with flush joint between panels; with 1-inch-wide flange for attaching interior finish; designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps.

1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024-inch nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

a. Exterior Finish: Fluoropolymer.
b. Color: As selected by Architect from manufacturer's full range.

2. Panel Coverage: 12 inches.
3. Panel Height: 1 inch.

2.8 ACCESSORIES

A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

NOT FOR BIDDING PURPOSES

B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
2. Clips: Manufacturer's standard, formed from steel sheet, designed to withstand negative-load requirements.
3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from steel sheet.
4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
6. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1-inch standoff; fabricated from extruded polystyrene.
7. Snow Guards: Approved by Metal Roof Panel Manufacturer.

C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

D. Flashing and Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match adjacent metal panels.

1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
2. Opening Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.

E. Gutters: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch-long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."

NOT FOR BIDDING PURPOSES

1. Gutter Supports: Fabricated from same material and finish as gutters.
2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.

F. Downspouts: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot-long sections, complete with formed elbows and offsets.

1. Mounting Straps: Fabricated from same material and finish as gutters.

G. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

H. Materials:

1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.

a. Fasteners for Metal Roof Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM sealing washer.
b. Fasteners for Metal Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with EPDM sealing washers bearing on weather side of metal panels.
c. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
d. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

2. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
3. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
4. Metal Panel Sealants:

a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.
b. Joint Sealant: ASTM C 920; one part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

2.9 FABRICATION

A. General: Design components and field connections required for erection to permit easy assembly.

1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.

NOT FOR BIDDING PURPOSES

2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.

B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.

C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.

1. Make shop connections by welding or by using high-strength bolts.
2. Join flanges to webs of built-up members by a continuous, submerged arc welding process.
3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
4. Weld clips to frames for attaching secondary framing if applicable, or punch for bolts.
5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.

D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

1. Make shop connections by welding or by using non-high-strength bolts.
2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.

E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

2.10 SOURCE QUALITY CONTROL

A. Special Inspection: Owner will engage a qualified special inspector to perform source quality control inspections and to submit reports.

1. Accredited Manufacturers: Special inspections will not be required if fabrication is performed by an IAS AC472-accredited manufacturer approved by authorities having jurisdiction to perform such Work without special inspection.

a. After fabrication, submit copy of certificate of compliance to authorities having jurisdiction, certifying that Work was performed according to Contract requirements.

NOT FOR BIDDING PURPOSES

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Before erection proceeds, survey elevations and locations of concrete-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.

1. Engage land surveyor to perform surveying.

C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.

B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING

A. Erect metal building system according to manufacturer's written instructions and drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

D. Base and Bearing Plates: Clean concrete-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

NOT FOR BIDDING PURPOSES

E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.

F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.

1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.

a. Joint Type: Snug tightened or pretensioned as required by manufacturer.

G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.

1. Provide rake or gable purlins with tight-fitting closure channels and fascia.
2. Locate and space wall girts to suit openings such as doors and windows.
3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

H. Steel Joists: Install joists, girders, and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders," joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Joist Installation: Bolt joists to supporting steel framework using carbon-steel bolts unless otherwise indicated.
5. Joist Installation: Bolt joists to supporting steel framework using high-strength structural bolts unless otherwise indicated. Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for high-strength structural bolt installation and tightening requirements.
6. Joist Installation: Weld joist seats to supporting steel framework.
7. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

I. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.

1. Tighten rod and cable bracing to avoid sag.
2. Locate interior end-bay bracing only where indicated.

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J. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

K. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.4 METAL PANEL INSTALLATION, GENERAL

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.

1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.

D. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.

   a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.

2. Install metal panels perpendicular to structural supports unless otherwise indicated.
3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Locate metal panel splices over structural supports with end laps in alignment.
6. Lap metal flashing over metal panels to allow moisture to run over and off the material.

E. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.

1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.

NOT FOR BIDDING PURPOSES

F. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

G. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.

1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

3.5 METAL ROOF PANEL INSTALLATION

A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.

1. Install ridge and hip caps as metal roof panel work proceeds.
2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.

B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.

1. Install clips to supports with self-drilling or self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement for thermal expansion and contraction. Predrill panels for fasteners.
6. Provide metal closures at peaks, rake edges, rake walls, and each side of ridge caps.

C. Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with exposed fasteners at each lapped joint, at location and spacing recommended by manufacturer.

1. Provide metal-backed sealing washers under heads of exposed fasteners bearing on weather side of metal roof panels.
2. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.
3. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps and on side laps of nesting-type metal panels, on side laps of ribbed or fluted metal panels, and elsewhere as needed to make metal panels weatherproof to driving rains.

NOT FOR BIDDING PURPOSES

4. At metal panel splices, nest panels with minimum 6-inch end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

D. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

E. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet on slope and location lines and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. When two rows of metal panels are required, lap panels 4 inches minimum.
4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
5. Rigidly fasten base end of metal wall panels and allow eave end free movement for thermal expansion and contraction. Predrill panels.
6. Flash and seal metal wall panels with weather closures at eaves and rakes, and at perimeter of all openings. Fasten with self-tapping screws.
7. Install screw fasteners in predrilled holes.
8. Install flashing and trim as metal wall panel work proceeds.
9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated on Drawings; if not indicated, as necessary for waterproofing.
10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Insulated Metal Wall Panels: Install insulated metal wall panels on exterior side of girts. Attach panels to supports at each panel joint using concealed clip and fasteners at maximum 42 inches o.c., spaced not more than manufacturer's recommendation. Fully engage tongue and groove of adjacent insulated metal wall panels.

1. Install clips to supports with self-tapping fasteners.
2. Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels as weather seal.

C. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet, noncumulative; level, plumb, and on location lines; and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

NOT FOR BIDDING PURPOSES

3.7 METAL SOFFIT PANEL INSTALLATION

A. Provide metal soffit panels the full width of soffits. Install panels perpendicular to support framing.

B. Flash and seal metal soffit panels with weather closures where panels meet walls and at perimeter of all openings.

3.8 THERMAL INSULATION INSTALLATION

A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.

1. Set vapor-retarder-faced units with vapor retarder toward warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.
2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.
3. Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths, with both sets of facing tabs sealed, to provide a complete vapor retarder.
4. Install blankets straight and true in one-piece lengths. Install vapor retarder over insulation, with both sets of facing tabs sealed, to provide a complete vapor retarder.

B. Blanket Roof Insulation: Comply with the following installation method:

1. Over-Framing Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal roof panels fastened to secondary framing.
2. Between-Purlin Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Hold in place with bands and crossbands below insulation.
3. Over-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Install layer of filler insulation over first layer to fill space formed by metal roof panel standoffs. Hold in place by panels fastened to standoffs.

   a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.

4. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.

   a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.

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5. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

C. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal wall panels fastened to secondary framing.

1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
2. Sound-Absorption Insulation: Where sound-absorption requirement is indicated for metal liner panels, cover insulation with polyethylene film and provide inserts of wire mesh to form acoustical spacer grid.

D. Board Wall Insulation: Extend board insulation in thickness indicated to cover entire wall. Hold in place by metal wall panels fastened to secondary framing. Comply with manufacturers' written instructions.

1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.9 DOOR AND FRAME INSTALLATION

A. General: Install doors and frames plumb, rigid, properly aligned, and securely fastened in place according to manufacturers' written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each door frame with elastomeric sealant used for metal wall panels.

B. Personnel Doors and Frames: Install doors and frames according to NAAMM-HMMA 840. Fit non-fire-rated doors accurately in their respective frames, with the following clearances:

1. Between Doors and Frames at Jambs and Head: 1/8 inch.
2. Between Edges of Pairs of Doors: 1/8 inch.
3. At Door Sills with Threshold: 3/8 inch.
4. At Door Sills without Threshold: 3/4 inch.
5. At fire-rated openings, install frames according to, and doors with clearances specified in, NFPA 80.

3.10 WINDOW INSTALLATION

A. General: Install windows plumb, rigid, properly aligned, without warp or rack of frames or sash, and securely fasten in place according to manufacturer's written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each window frame with elastomeric sealant used for metal wall panels.

1. Separate dissimilar materials from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in AAMA/WDMA/CSA 101/I.S.2/A440.

B. Set sill members in bed of sealant or with gaskets, for weathertight construction.

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C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

3.11 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.
2. Tie downspouts to underground drainage system indicated.

E. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

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3.12 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform field quality control special inspections and to submit reports.

B. Product will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.13 CLEANING AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

C. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates, and accessories.

1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

D. Touchup Painting: Cleaning and touchup painting are specified in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."

E. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

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SECTION 21 01 70

FIRE SUPPRESSION SPRINKLER SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Codes and Standards listed below, apply to work indicated on the drawings and in the specifications.

1. National Fire Protection Association (NFPA)
2. Delaware State Fire Prevention Regulations (DSFPR)
3. American National Standards Institute (ANSI)
4. American Society for Testing Materials (ASTM)
5. National Electrical Manufacturer's Association (NEMA)
6. Underwriters' Laboratories (UL)

1.2 SUMMARY

A. This Section includes fire-suppression sprinklers, piping, and equipment for the following building systems:

1. Wet-pipe, fire-suppression sprinkler systems, including piping, valves, specialties and automatic sprinklers.

2. Wet pipe, fire suppression standpipe system, including piping, hose valves, valves, and specialties.

3. Contractor shall provide schedule and location of all fire hose valve cabinets on sprinkler drawings regardless of which trade procures or installs them.

B. Additional work includes, but is not limited to the following:

1. Obtain and pay for all permits, licenses, approvals, reviews, utility shutdowns, water flow testing, pressure tests and acceptance inspections.

2. Pipe sleeves through floors, walls and structural elements of the building, set in coordinated locations. Penetrations created in fire rated walls and floors, shall have their smoke stopping and fire rating integrity restored with the use of fire tested, U.L. listed details, that have prior approval of the local Fire Prevention Bureau.

3. All cutting, coring and patching of general construction as necessary for installation of the work specified.

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4. Coordinated working drawings and hydraulic calculations from water flow test data less than one-year old; submit and obtain approval by the local Fire Prevention Bureau and Owner's Insurance Underwriter, and State Fire Marshal.

5. Clean-up, on a daily basis, of all debris associated with the installation of this work, as necessary to maintain the premises in a broom swept condition.

6. Testing, adjusting, retesting, re-adjusting as may be required to obtain system acceptance by the local Fire Prevention Bureau, Owner's Insurance Underwriter, State Fire Marshal and Owner's Representative. Fire Protection Contractor shall remain responsible for the fire protection systems until all approvals are obtained.

7. Provide equipment manuals, record drawings, valve tag schedules and personnel instruction, prior to system turnover to the Owner.

8. Provide fire protection on all floors during construction, utilizing temporary standpipes or fire extinguishers, according to the requirements of the authority having jurisdiction.

9. Performance of all work specified in this Section shall be in compliance with the requirements of the Occupational Safety and Health Act and Construction Safety Standards.

C. The work in this Section includes providing all labor, materials, specialty products testing and services for, and reasonably incidental to, the satisfactory completion of the Fire Protection systems, as indicated on the Contract Drawings, in the Specification Sections, and as required by the applicable Codes and Standards.

D. The following related work is specified in other Divisions and Sections of the specification.

1. Electrical power supply to water flow switches, tamper switches (low air switches, releasing control panels, electric bells).

2. Fire extinguishers and cabinets.

1.3 DEFINITIONS AND INTERPERTATIONS

A. Specific terminology used in the Design Drawings and Specifications shall have the following meanings;

1. "Piping" includes pipe, fittings, flanges, valves, controls, hangers, supports, vents, drains and other customarily required items required in connection with the transfer of gases and fluids.

2. "Install" includes unloading at the delivery point for the project and performing all tasks necessary to establish a secure mounting and correct operation, for items and assemblies furnished by other trades or the Owner.

3. "Furnish" includes purchase and delivery to the project site, of items and assemblies, complete with every necessary appurtenance.

4. "Provide" shall mean "Furnish and Install"

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5. “Concealed” when used in connection with the installation of piping, shall mean hidden from view behind chases, furred spaces, pipe shafts, or above suspended ceilings.

6. “Concealed Spaces of Combustible Construction shall be as defined in NFPA#13, Section 8.15.1.

7. “Contractor” shall mean the Fire Protection contractor and his vendors, fabricators or subcontractors.

8. “Design Drawings” shall mean documents, including drawings and written specifications, prepared by the Architects and Engineers, to obtain building permits and competitive bid proposals from contractors, for construction of the specified fire protection systems.

9. “Working Plans” shall mean documents, including calculations, drawings and material specifications prepared by the fire protection contractor, according to NFPA#13, for obtaining approval from the authority having jurisdiction, Owner’s insurance underwriter, Architect/Engineer and the State Fire Marshal.

10. “NPS” shall mean nominal pipe size, in inches.

11. “CPVC” shall mean Chlorinated polyvinyl chloride plastic.

12. “Owner” shall mean Brandywine School District.

13. “Architect” shall mean the Architect of Record as denoted in this package.

14. “Engineer” shall mean the Engineer of Record as denoted in this package.

15. “UL” means Underwriter’s Laboratories

16. “FM” means Factory Mutual.

17. “Sprinkler System” shall mean piping and sprinklers under the individual control of a supervised control valve, with provisions for alarm annunciation, alarm testing and system drainage.

18. “Standpipe” shall mean piping, valves, hose connections, and allied equipment with the hose connections located such that water can be discharged through attached hose and nozzles, for the purpose of extinguishing a fire, thereby protecting a building, structure, its contents, and the occupants.

19. Reference applicable NFPA Standards for additional definitions that shall apply to work under this Section.

B. The use of the Design Drawings and Specifications by the contractor, for Bid Proposal and Working Drawing preparation, shall include the following understandings:

1. The information included in the drawings and specifications is given as a guide only, to indicate general design feasibility and to show an acceptable arrangement of system zones, system types, sprinkler positions, main piping location and equipment layout.

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2. The design drawings utilize symbols and diagrams to indicate required work, representing only the sequence of items to be installed, which have no dimensional significance and do not indicate every required item to be provided. The work shall be installed in accordance with the diagrammatic intent expressed on the drawings, in conformity with the dimensions indicated on the final architectural and structural working drawings, and final equipment shop drawings. Information regarding general construction shall be derived only from the Architectural and Structural Design Drawings and Specifications.

3. The drawings and specifications are complementary and are to be utilized together for a complete interpretation of the work intended. The higher capacity or standard shall be provided, where conflicts between the drawings and specifications, or conflicts within themselves, occur.

4. The limitations of the language used on the drawings and specifications shall not be interpreted as meaning that accessories and appurtenances, required for completion of work, are to be excluded. The description of any item, on the drawings or in the specifications or both, requires the installation of all it's necessary components for approved, satisfactory operation. These drawings do not indicate sprinkler head locations. The Contractor shall reference the architectural reflected ceiling plans. The intent is to establish an architecturally acceptable arrangement of sprinklers with other ceiling elements including lights, diffusers, speakers etc., to be repeated in similar areas. Provide sprinklers according to the NFPA#13 occupancy hazard classification and spacing rules, for unfinished ceiling area.

5. Submission of a bid proposal requires the contractor to review all project documents and visit the construction site, to be thoroughly familiar with all requirements for the project, and identify in his bid, conditions that may affect the efficient and satisfactory performance of the work. Claims for additional compensation shall be denied if the above procedures are not followed and the disputed conditions may have been identified by the completion of these required tasks.

6. The information shown on the design drawings and written in the specifications shall not be interpreted as to instruct the contractor to not follow the applicable codes or local amendments. Where the information provided is believed not to be in conformance with the code requirements, the contractor shall notify the Architect and Engineer for clarification prior to the submission of his bid proposal.

7. References to providing sprinklers per the NFPA#13 Standard mandates that all building areas shall be provided with complete, full sprinkler protection, unless specific notation is made to the contrary on the drawings or in the specification.

8. References in this Specification to NFPA Standards as design and installation guidance of fire protection systems, invoke all of the Sections, Subsections, Exceptions and Advisory Provisions of the Standard that are applicable to the Project's requirements; they are hereby included in this Specification as if repeated in their entirety, and are referenced to convey the minimum acceptable performance and installation requirements acceptable.

9. All the referenced information and guidance for design noted prior shall also be used and adhered to in the design of the fire suppression standpipe systems. Fire suppression standpipe

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systems shall be designed and installed in accordance with NFPA 14 and the Delaware State Fire Prevention Regulations (State/City Fire Codes).

1.4 SPRINKLER SYSTEM PERFORMANCE REQUIREMENTS

A. Design sprinkler system piping according to the following requirements and obtain approval from authorities having jurisdiction, Owner's insurance underwriter, Architect, Engineer and Fire Marshal. Refer to Section 1.7 QUALITY ASSURANCE, paragraph I., Working Plans and Hydraulic Calculations, and Section 3.1 PREPARATION WORKING OF PLANS, for additional system performance related design requirements.

B. Design sprinkler system piping according to the following:

1. Include 10 psi cushion pressure as a margin of safety in available water flow and pressure calculations.

2. Include losses from point of connection to city water main, through water-service entrance, backflow preventer, sprinkler system piping, including all valves, fittings and devices.

3. Maximum piping velocity shall be limited to 20 fps.

4. Sprinkler Occupancy Hazard Classifications shall be as follows:

a. Classrooms, Art Rooms, Music Rooms, Multi-Purpose Room: Light Hazard

b. Offices, Corridors, Toilet rooms, Locker rooms, Public Areas, Cafeteria Seating Areas: Light Hazard

c. Building Service Areas, Kitchen, Janitor's Closets, Electrical and Telephone Equipment Rooms and Closets, Mechanical Equipment Rooms: Ordinary Hazard, Gp. 1.

d. General Storage Areas, Stage Loading Docks: Ordinary Hazard, Gp. 1.

e. Combustible construction and Combustible concealed spaces: Light Hazard.

f. All other occupancies and hazards not noted, shall be in accordance with NFPA.

5. Minimum Density for Automatic-Sprinkler Piping Design shall be as follows:

a. Light Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area unless otherwise indicated on drawing data schedule.

b. Ordinary Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area unless otherwise indicated on drawing data schedule.

c. Ordinary Hazard, Group 2 Occupancy: 0.20 over 1,500 sq. ft. area unless otherwise indicated on drawing data schedule.

d. Combustible construction and Combustible concealed spaces: 0.10 gpm over 1500-sq. ft. area unless otherwise indicated on drawing data schedule.

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e. Special Occupancy Hazard: As determined by authorities having jurisdiction.

f. For light and ordinary hazard occupancies, where the requirements of NFPA 13 are met, design are reduction for quick response sprinklers may be used.

C. Components and Installation shall be capable of producing piping systems with 175-psig minimum working-pressure rating, unless otherwise indicated.

1.5 SUBMITTALS

A. The contractor shall provide Submittals according to Section 220010, with all required drawings, calculations and product data for complete review of the proposed system installation submitted at the same time. Incomplete submittals shall be returned unreviewed. When resubmittals are required, all changes from the original submittal shall be clearly identified with revision triangles and clouds.

B. Product Data shall be provided for the following:

1. Pipe and fitting materials and methods of joining for sprinkler piping.

2. Pipe hangers and supports.

3. Valves, including specialty valves, accessories, and devices.

4. Alarm devices. Include electrical data.

5. Air compressors. Include electrical data.

6. Fire department connections. Include type; number, size, and arrangement of inlets; caps and chains; size and direction of outlet; escutcheon and marking; and finish.

7. Sprinklers, escutcheons and guards. Include sprinkler flow characteristics, mounting, finish, and other pertinent data.

8. Fire stopping product materials and U.L. listed installation details for penetrations of fire-rated walls and floors.

9. Fire hose station equipment including hose valves, hose adapters and hose cabinets.

C. Fire-Hydrant Flow Test has been executed for the project on _____ and data is recorded on the drawing. (The Fire Protection Contractor shall be required to provide a current, less than one year old, for use in hydraulic calculations of the systems designs.)

D. Sprinkler and Standpipe Piping Drawings: Working plans and hydraulic calculations, shall be prepared according to NFPA #13 and NFPA #14, and submitted to the authorities having jurisdiction, Owner's insurance agent, Architect, Engineer, and State Fire Marshal for approval.

E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA #13 and NFPA #14, including the

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"Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping" for each system.

F. Maintenance Data: shall be submitted for each type of sprinkler component and specialty, and included in the maintenance manuals, specified in Division 1.

G. Record Drawings: Refer to Division 1 for requirements. An up to date set of working drawings shall be kept at the site to record minor change in the intended system installation, as as-built conditions. Provide the required copies of final working drawings, corrected to show all as-built conditions, to the Owner, and the Owner's insurance agent upon completion of the project.

H. System Diagram and Operating Instructions: Provide at the completion of work, a color coded, neatly drawn small scale plan, mounted in a substantial glass enclosed frame, showing the locations of all sprinkler system control valves, auxiliary low point drains and inspector's test connections. Provide a minimum of two (2) copies of the current edition of NFPA#25, "Standard for the Inspection, Testing, and Maintenance of Water Based Fire Protection Systems".

I. Guarantee: The contractor shall submit a written guarantee of all materials and workmanship for a period of one (1) year, beginning at the date of final acceptance or beneficial use to the Owner, which includes emergency repair service for sprinkler systems, within four (4) hours, on a twenty-four (24) hour, seven (7) day a week basis, upon request for repair service by the Owner.

1.6 QUALITY ASSURANCE

A. All materials, specialty products, equipment, methods of installation, and the application of materials and products in specific situations, shall be in strict accordance with the applicable requirements of NFPA #13 and NFPA #14, and have the prior approval of the authority having jurisdiction. All materials and equipment shall be U.L. labeled and/or F.M. approved, and installed in accordance with their listings.

B. Installer Qualifications: An experienced installer who has designed and installed fire-suppression systems similar to that indicated for this Project and obtained design approval and inspection approval from authorities having jurisdiction.

C. Manufacturer Qualifications: Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in UL's and/or Fire Marshal's "Fire Protection Equipment Directory" and that comply with other requirements indicated.

D. Sprinkler Components: Listing/approval stamp, label, or other marking by a testing agency acceptable to authorities having jurisdiction.

E. Working Plans and Hydraulic Calculations

1. Design the specified sprinkler systems utilizing hydraulic calculations and indicate the intended installation of systems accurately on minimum 1/8"scale plans, with ¼" scale details which include the following:

   a. Building section/elevation details, with all necessary elevation data shown.

   b. Riser diagram of system water supply and backflow prevention.

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c. All pipe lengths, diameters, fittings, hanger locations and details, earthquake bracing and restraints, valves and devices with piping details.

d. A site plan indicating project location, site elevations, north arrow, street intersections, Fire Department access lane(s), location of Fire Department connection(s), and size, material and location of public, and private fire water service mains and their appurtenances. The site plan shall be scaled or indicate dimensions and distances (of mains) and show location of water flow test(s).

e. Hydraulically most remote design area(s) with hydraulic nodes on plans corresponding to hydraulic calculations.

2. Provide hydraulic calculations utilizing Hazen-Williams formula for determining piping friction losses, to prove the intended design, according to the requirements NFPA#13 and NFPA #14, using "C" values therein, which include the following:

a. Each type of pipe and joining method to be used, including weight, schedule, wall thickness, exact internal diameters, wall thicknesses and corrosion resistance ratio (CRR), for pipes other than Sch. 40.

b. The K-factor, orifice diameter, and minimum operating pressure required, for each flowing sprinkler in the hydraulically most remote area(s), according to the worst case requirements of either NFPA#13, NFPA #14, the local Fire Dept., or the appropriate approval/U.L. listing pressure required, to deliver the required minimum water distribution. Flows shall be calculated to the nearest 1/10 gallon.

c. Piping friction losses calculated to the nearest foot for all pipe lengths over (1) foot; all vertical lengths shall be included to show loss or gain of elevation pressures. Pressures shall be calculated to the nearest 1/100 psi.

d. Pressure losses for dry valves, deluge valves, backflow preventers etc., shall be clearly indicated as a device, and expressed as additional feet of pipe.

e. Velocity in all piping to be 20 feet per second or less. Velocity pressure may be ignored in hydraulic calculations.

f. Provide hydraulic calculations in an "easily reviewable" format, similar to the traditional NFPA#13 presentation, including the name of the hydraulic calculation program used, if applicable. The order of entry shall follow the flow of water from the most remote design sprinkler back to the riser, with flows added and subtracted at the cross main; order entry based upon only a sequential ordering of the node numbers, which could result in jumps from one pipe segment to a disjunct segment, is not "easily reviewable", and therefore is not an acceptable submittal format.

g. All notes in the hydraulic calculations corresponding to the calculated results shall be clearly identified on the plans, including the site plan.

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1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounting steel cabinet and hinged cover, with space spare sprinklers plus sprinkler wrench. Include the minimum number of each type of sprinkler in the project, as required by NFPA #13.

1.8 LEAK DAMAGE

A. The fire protection contractor shall be responsible during the installation and testing of the sprinkler system(s), for damage to building, it's contents, the work of other trades etc., caused by leaks or overflow from equipment, defective valves, disconnected or unplugged pipes, fittings etc., and shall pay for the repair or replacement of work or facilities damaged by such leaks.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Specialty Valves and Devices:

Vicatulic Company
Tyco Fire Suppression & Building Products
Reliable Automatic Sprinkler Co., Inc.
Viking Corp.

2. Water-Flow Indicators and Supervisory Switches/and Electrical Bells:

Tyco Fire Suppression & Building Products
Potter Electric Signal Co.
Reliable Automatic Sprinkler Co., Inc.
Viking Corp.

3. Sprinkler, Drain and Alarm Test Fittings:

Tyco Fire Suppression & Building Products
Fire-End and Croker Corp.
Victaulic Company
AFG Manufacturing

4. Sprinkler, Branch-Line Test Fittings:

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Elkhart Brass Mfg. Co., Inc.
Fire-End and Croker Corp.
Smith Industries, Inc.; Potter-Roemer Div.
AFG Manufacturing

5. Sprinkler, Inspector's Test Fittings:

   Fire-End and Croker Corp.
   G/J Innovations, Inc.
   Triple R Specialty of Ajax, Inc.
   AFG Manufacturing

6. Fire Department Connections:

   Potter-Roemer
   Elkhart Brass Mfg. Co., Inc.
   Fire-End and Croker Corp.
   Tyco Fire Suppression & Building Products
   Guardian Fire Equipment, Inc.
   Reliable Automatic Sprinkler Co., Inc.

7. Sprinklers:

   Tyco Fire Suppression & Building Products
   Reliable Automatic Sprinkler Co., Inc.
   Viking Corp.
   Victaulic Company

8. Fire Dept. Hose Valves:

   Potter-Roemer
   Elkhart
   Fire-End and Croker Corp.
   Guardian Fire Equipment, Inc.

   Fire Hose Valve Cabinets:

   Potter-Roemer
   Larsen
   Guardian Fire Equipment, Inc.
   Fire-End and Croker Corp.

9. Fire-Protection-Service Valves:

   Tyco Fire Suppression & Building Products
   Central Sprinkler Corp.
   Nibco, Inc.
   Stockham Valves & Fittings, Inc.
   Victaulic Company

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10. Keyed Couplings for Steel Piping: (Grooved Fittings)

    Tyco Fire Suppression & Building Products
    Victaulic Company
    Viking Corp.
    Anvil International Grulok

11. Fire Protection Backflow Prevention Valve Assemblies (including RPZ Type).

    Ames Fire & Waterworks
    Watts Regulator Company
    Apollo Valves (Conbraco)

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials in specific fire protection services. All piping shall be permanently marked continuously along its length by the manufacturer, properly identifying the type of pipe. All fittings shall be stamped or embossed by the manufacturer, indicating the size, pressure rating, and U.L. listing or F.M. approval.

2.3 PIPES AND TUBES

A. Standard-Weight Steel Pipe: ANSI/ASTM A 53, ASTM A 135, or ASTM A 795; Schedule 40 in NPS 6" and smaller, and Schedule 30 in NPS 8" and larger, may be joined with threads or cut-groove couplings and fittings, for pressures up to 300 psi.

B. Schedule 30 Steel Pipe: ASTM A 135 or ASTM A 795, with wall thickness less than Schedule 40 and equal to or greater than Schedule 30, or ASTM A 795 and ASME B36, 10M, Schedule 30 wrought-steel pipe, may be joined by welding or roll-groove couplings and fittings, for pressures up to 300 psi.

C. "THINWALL/SCHEDULE 10," "XL" AND CPVC piping shall <u>not</u> be permitted on this project.

2.4 CPVC PLASTIC PIPE

A. PIPE: 2" and smaller - Postchlorinated polyvinyl chloride (CPVC) pipe manufactured by R&G Sloane or Spears using B F Goodrich "Blazemaster" plastic resins. The fire sprinkler pipe shall be manufactured to ASTM standard F442, with a Standard dimensional ratio (SDR) of 13.5, UL listed.

B. FITTINGS: Postchlorinated polyvinyl chloride (CPVC) fittings manufactured by R&G Sloane, Spears, Harve, Nibco, or Viking using Lubrizol "Blazemaster" plastic resins. The fire sprinkler pipe fitting shall be manufactured to ASTM standard F438 (Schedule 40 fittings) and F439 (Schedule 80 fittings), both UL approved.

C. UNIONS: Postchlorinated polyvinyl chloride (CPVC) union fitting manufactured by R&G Sloane, Spears, Harve, Nibco, or Viking using Lubrizol "Blazemaster" plastic resins with Viton O-Ring seal. The fire sprinkler pipe fitting shall be manufactured to ASTM standard F438 (Schedule 40 fittings) and F439 (Schedule 80 fittings), both UL approved.

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Postchlorinated polyvinyl chloride (CPVC) Grooved Coupling Adapter fitting manufactured by R&G Sloane, Spears, Harve, Nibco, or Viking using Lubrizol "Blazemaster" plastic resins. The fire sprinkler pipe fitting shall be manufactured to ASTM standard F438 (Schedule 40 fittings) and F439 (Schedule 80 fittings), both UL approved.

D. FLANGES: Postchlorinated polyvinyl chloride (CPVC) Flange fitting manufactured by R&G Sloane, Spears, Harve, Nibco, or Viking using Lubrizol "Blazemaster" plastic resins. The fire sprinkler pipe fitting shall be manufactured to ASTM standard F438 (Schedule 40 fittings) and F439 (Schedule 80 fittings), both UL approved.

E. TRANSITION The transition between steel pipe to plastic pipe shall be made with a Grooved Coupling Adapter on the plastic and a roll groove on the metal pipe in accordance with Victaulic's specifications for roll grooving pipe. Transition for sprinkler head shall be made with approved sprinkler head fitting with brass thread insert, such as sprinkler head 90° ell, female sprinkler head adapter, etc.

F. COUPLINGS: Victaulic Style 75 with ductile or malleable iron housing clamps or equal.

G. JOINTS: Slip x Slip couplings, grooved coupling adapter and/or flanges.

H. THREAD LUBRICANT: Teflon tape.

I. PIPE JOINING: Pipe and fittings are to be joined using postchlorinated polyvinyl chloride (CPVC) primer and cement approved by the pipe manufacturer for use on the "Blazemaster" plastic pipe and fitting material, and be UL listed. “One Step” primer/cement is permitted to be used if listed and approved by the pipe manufacturer.

J. GASKETS: See pipe Specification FPPS - 4.

K. BOLTING: Carbon steel square head machine bolts and hex nuts, ASTM A307, Grade B.

L. BUTTERFLY VALVES: 1" through 2" - See pipe Specification FPPS - 4.

M. GATE VALVES: 2" and smaller - See pipe Specification FPPS - 4.

N. CHECK VALVES: 2" and smaller - See pipe Specification FPPS - 4.

O. INSTALLATION OF VALVES: Butterfly valves (with tamper switches), within the size limitations specified, may be used in lieu of gate valves with tamper switches.

P. APPROVALS: All material shall be UL listed.

2.5 PIPE AND TUBE FITTINGS

A. Cast-Iron Threaded Flanges: ASME B16.1.

B. Cast-Iron Threaded Fittings: ASME B16.4.

C. Malleable-Iron Threaded Fittings: ASME B16.3.

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D. Steel, Threaded Couplings: ASTM A 865.

E. Steel Welding Fittings: ASTM A 234/A 234M, ASME B16.9, or ASME B16.11.

F. Steel, Grooved-End Fittings: UL-listed and approved, ASTM A 47, malleable iron or ASTM A 536, ductile iron; with dimensions matching steel pipe and ends factory grooved according to AWWA C606.

2.6 JOINING MATERIALS

A. Refer to Division 22 Section "Basic Mechanical Materials and Methods" for pipe-flange gasket materials and welding filler metals.

B. Steel, Keyed Couplings: UL 213 and AWWA C606, for steel-pipe dimensions. Include ASTM A 536, ductile-iron housing, rubber gaskets, and steel bolts and nuts. Include listing for dry-pipe service for couplings for dry piping.

2.7 FIRE-PROTECTION-SERVICE VALVES

A. General: UL listed and approved, with minimum 175-psig nonshock working-pressure rating. Valves for grooved-end piping may be furnished with grooved ends instead of type of ends specified.

B. Gate Valves, NPS 6” and Smaller: UL 262; cast-bronze, threaded ends; solid wedge; OS&Y; and rising stem.

C. Indicating Valves, NPS 3” and Smaller: UL 1091; butterfly or ball-type, bronze body with threaded ends; and integral indicating device.

Indicator: Visual.
Indicator: Electrical 115-Vac prewired, two-circuit, supervisory switch.

D. (Optional Section) Gate Valves, NPS 4” and Larger: UL 262, iron body, bronze mounted, taper wedge, OS&Y, and rising stem. Include replaceable, bronze, wedge facing rings and flanged ends.

E. Swing Check Valves, NPS 2” and Smaller: UL 312 or MSS SP-80, Class 150; bronze body with bronze disc and threaded ends.

F. Swing Check Valves, NPS 2-1/2” and Larger: UL 312, cast-iron body and bolted cap, with bronze disc or cast-iron disc with bronze-disc ring and flanged ends.

G. Split-Clapper Check Valves, NPS 4” and Larger: UL 312, cast-iron body with rubber seal, bronze-alloy discs, and stainless-steel spring and hinge pin.

2.8 SPRINKLERS

A. Utilize quick-response sprinklers throughout Light and Ordinary Hazard occupancies

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B. Automatic Sprinklers: shall have heat-responsive element complying with the following:

UL 199, for applications except residential.
UL 1767, for early suppression, fast-response applications.

C. Sprinkler Types and Categories: Nominal 1/2-inch standard orifice, unless otherwise indicated or required by application.

D. Sprinkler types, features, and options include the following:

Dry upright sprinklers
Dry pendent sprinklers
Horizontal Dry/Sidewall sprinklers
Pendent sprinklers (Flush, recessed and/or concealed)
Quick-response sprinklers
Sidewall sprinklers
Upright sprinklers

E. Sprinkler Finishes: Upright bronze, and "white" painted pendent and sidewalls.

F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

Ceiling Mounting: White-plated steel, two piece, flat.
Ceiling Mounting: Metal, white finish, two piece, flat.
Sidewall Mounting: White-plated steel, two piece, flat.
Sidewall Mounting: Metal, white finish, two piece, flat.

G. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.

H. Sprinkler Water Shields: Shield for protecting sprinkler, heat-sensing operating element from other sprinkler water discharge (pendent and/or upright sprinkler water shield.

2.9 SPECIALTY SPRINKLER FITTINGS

A. Specialty Fittings: UL listed and approved; made of steel, ductile iron, or other materials compatible with piping.

B. Locking-Lug Fittings: UL 213, ductile-iron body with locking-lug ends.

C. Mechanical-T Fittings: UL 213, ductile-iron housing with pressure-responsive gasket, bolts, and threaded or locking-lug outlet.

D. Mechanical-Cross Fittings: UL 213, ductile-iron housing with pressure-responsive gaskets, bolts, and threaded or locking-lug outlets.

E. Drop-Nipple Fittings: UL 1474, with threaded inlet, threaded outlet, and seals; adjustable.

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F. Sprinkler, Drain and Alarm Test Fittings: UL-listed, cast- or ductile-iron body; with threaded inlet and outlet, test valve, and orifice and sight glass.

G. Sprinkler, Branch-Line Test Fittings: UL-listed, brass body; with threaded inlet and capped drain outlet and threaded outlet for sprinkler.

H. Sprinkler, Inspector's Test Fittings: UL-listed, cast- or ductile-iron housing; with threaded inlet and drain outlet and sight glass.

2.10 FIRE DEPARTMENT CONNECTIONS

A. Confirm with the local Fire Department for type of connection requirement: Storz or Siamese.

B. Wall, Fire Department Connections: UL 405; cast-brass body with brass, wall, escutcheon plate; brass, lugged caps with gaskets and brass chains; and brass, lugged swivel connections. Include inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, outlet with pipe threads, extension pipe nipples, check devices or clappers for inlets, and escutcheon plate with marking "AUTO SPKR"/"STANDPIPE AND AUTO SPKR".

Type:	Flush mounting.
Escutcheon Plate:	Rectangular.
Finish:	Polished chrome-plated.

2.11 ALARM DEVICES

A. General: All alarm devices shall be U.L. listed and F.M. approved as sprinkler system attachments. Types utilized shall match piping and equipment connections.

B. Electric-Operated Alarms: Provide 10" outside waterproof vibrating type bell and 6" inside bell, in locations shown on drawings or required by the local Fire Dept.

C. Water-Flow Indicators: UL 346; electrical-supervision, vane-type water-flow detector; with 250-psig pressure rating; and designed for horizontal or vertical installation. Include two single-pole, double-throw, circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.

D. Pressure Switches: UL 753; electrical-supervision-type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow.

E. Valve Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled valve is in other than fully open position.

F. Low air Supervisory Switch: UL listed, electrical-supervisory-type, pressure activated, single pole, double throw, normally closed contacts, field adjustable and designed to operate on a decrease in air pressure.

G. Low Temperature Supervisory Switch: UL listed, electrical-supervisory-type, temperature activated, normally open contact, operated at set temperature of 40°F.

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2.12 PRESSURE GAGES

A. Pressure Gages: UL 393, 3-1/2- to 4-1/2-inch diameter dial with dial range of 0 to 250 psig.

2.13 PREACTION SUPPRESSION SYSTEM

A. The system shall be a complete and operating, supervised, single interlocked, controlled electric release with riser-mounted air compressor system.

B. The equipment shall be a total Viking System that shall include all system components, devices, valves, fittings, control panel, compressor, etc., for a field installation.

C. The installation shall be in strict conformance with the manufacturer's written instructions and schematic diagrams.

D. Electrical power wiring shall be provided to the control panel and to the compressor by the Electrical Subcontractor. All wiring beyond that point shall be considered control wiring, and shall be the responsibility of the Fire Protection Contractor. This includes detector wiring between the heat detectors and the control panel.

E. Heat detectors for the system are <u>not</u> included in the Viking package. The detectors shall be furnished by the fire alarm Subcontractor.

PART 3 – EXECUTION

3.1 PREPARATION OF WORKING PLANS

A. The contractor shall be responsible for reviewing the Architectural and Structural Design Drawings and verifying with the General Contractor, that substitutions of noncombustible building materials with combustible building materials have not been made that alter the requirements of the sprinkler system shown on the Fire Protection Design Drawings. Report such substitutions to the Architect and Engineer for review, prior to the design of sprinkler systems. Combustible framing or construction is not allowed above ceilings, below floors or in concealed spaces, unless specifically protected by sprinklers.

B. The final arrangement, positions and connections of pipes, drains, valves, sprinklers etc., shall be established by the fire protection contractor's design, and shall be configured to drain fully, avoiding trapped piping sections and excessive auxiliary drains. Sprinkler systems shall be installed concealed above architectural suspended ceilings where ceilings are provided, unless indicated otherwise.

C. Design the specified fire protection systems from the fire service entry riser, in accordance with the mandatory requirements and all advisory provisions of NFPA#13 and NFPA#14, the requirements of the authority having jurisdiction and the Owner's insurance agent, utilizing hydraulic calculations, with uniform water distribution over each most remote design area and/or specified demand.

D. Establish each sprinkler position, giving full consideration to the vertical and horizontal obstructions to sprinkler spray pattern development that may be presented by building construction, ductwork, mechanical and electrical equipment, piping, soffits and ceilings

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constructed with different adjacent elevations, suspended and surface mounted lighting fixtures etc.; coordinate the position and location of sprinklers, piping and system components, referencing the detailed working drawings of all other trades, to avoid installation conflicts.

E. Contractor shall be responsible for planning and providing the required penetrations of fire rated walls, floors and smoke partitions, in such a manner that U.L. listed details that restore their fire rating integrity and that have prior approval of the Delaware State Fire Marshal's Office where they are utilized.

F. Where practical, uniformly space sprinklers on branchlines; sprinklers shall be spaced in architectural patterns consistent with symmetrical positions of lights, air diffusers, speakers, and other ceiling elements, where sprinklers are shown on architectural reflected ceiling grid plans.

1. Pendent sprinklers in architectural ceilings shall be centered in square ceiling tiles in both directions, and centered in the short dimension of rectangular tiles with sprinkler positions acceptable at quarter points of the long dimension, +/- 12".

2. Provide sprinkler spacing and locations per NFPA#13 requirements, in areas without suspended ceilings.

G. Wet sprinkler systems may be "tree", "loop" or "grid" type systems, as may be hydraulically advantageous, unless a specific piping arrangement is indicated on the design drawings. System piping arrangement shall be configured above the top of recessed lighting fixtures, within suspended ceilings.

H. Where sprinkler piping within concealed spaces provides protection for occupancies below, sprinklers for protection of concealed spaces may be attached to the same piping system. Hydraulically calculate each set of sprinklers separately and provide pipe sizes for the hydraulically more demanding group.

I. Sprinklers for the protection of attic spaces may be conventional upright or pendent types, or a combination of these types of sprinklers. The position of sprinklers in attics framed of combustible construction, shall establish sprinkler protection into the eaves overhanging the outside of the building.

J. Provide sprinkler protection in combustible framed, horizontal and vertical soffits and wall cavities with outside finished dimensions greater than 14." Where combustible concealed construction and spaces are permitted to be unsprinklered, meeting one or more of the exceptions of NFPA#13, Section 8.15.1.1, the design area of application shall be increased to a minimum of 3,000 sq.ft., without revising the hydraulic density, per NFPA#13, Section 11.2.3.1.5 and 11.2.3.2.

K. Where used, antifreeze systems shall use pharmaceutically pure glycerin or propylene glycol only and shall be premixed in accordance with NFPA 13. Provide a reduced pressure zone backflow preventer assembly and an expansion chamber where noted on the drawings, at the point of connection to the wet sprinkler system supply. Pipe discharge port of backflow preventer to a drain point capable of accepting full flow discharge. Antifreeze systems over 40 gallons total capacity shall be hydraulically calculated using the Darcy-Weisback equation, Moody Diagram, E-factors for age of pipe, and adjusted K-factors for fluid properties.

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3.2 PIPING APPLICATIONS

A. Flanges, unions, transitions and special fittings shall have pressure ratings the same as or higher than system's static pressure rating for use in aboveground applications, unless otherwise indicated.

B. Piping between Fire Department Connections and Check Valves: Use galvanized, standard weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.

C. Underground Service-Entrance Piping: Use ductile-iron, push-on-joint pipe and fittings and restrained joints.

Fire Suppression Bulk Mains and Risers

D. Wet-Pipe Sprinkler Branch Piping:

1. NPS 2-1/2” and Larger: Standard weight steel pipe with roll-grooved ends; steel, grooved-end fittings; and grooved couplings.

2. NPS 2” and Smaller: Standard-weight steel pipe with threaded ends, cast- or malleable-iron threaded fittings, and threaded joints.

E. Drypipe Sprinkler Branch Piping:

1. NPS 2-1/2” and larger: Standard weight, hot dipped galvanized steel pipe with grooved ends, steel grooved-end fittings and grooved couplings.

2. NPS 2” and smaller: Standard weight, hot dipped galvanized, steel pipe with threaded ends, cast or malleable iron, threaded fittings and threaded joints.

3.3 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Fire Protection-Service Valves: UL listed and approved for applications where required by NFPA #13.

Shutoff Duty: Use gate and/or butterfly valves.

2. General-Duty Valves: For applications where UL-listed and approved valves are not required by NFPA #13.

Shutoff Duty: Use gate, ball, or butterfly valves.

3.4 JOINT CONSTRUCTION

A. Refer to Division 22 Section "Basic Mechanical Materials and Methods" for basic piping joint construction. Apply joint compound or tape to male threads only.

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B. Steel-Piping, Grooved Joints: Use Schedule 40 steel pipe with cut or roll-grooved ends; steel, grooved-end fittings; and steel, keyed couplings. Assemble joints with couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions. Use gaskets listed for dry-pipe service for dry piping.

C. Locking-Lug-Fitting, Twist-Locked Joints: Follow fitting manufacturer's written instructions.

D. Dissimilar-Piping-Material Joints: Construct joints using adapters or couplings compatible with both piping materials. Use dielectric fittings if both piping materials are metal. Refer to Division 22 Section "Basic Mechanical Materials and Methods" for dielectric fittings.

3.5 WATER-SUPPLY CONNECTION

A. Connect sprinkler piping to the 12” stubbed-up flanged outlet connection provided by the Plumbing Contractor.

B. Install shutoff valve, backflow preventer, riser check valve assembly, pressure gage, drain, and other accessories indicated at connection. The backflow preventer shall be UL listed for fire protection service. Backflow preventer for this project shall be AMES 3000 “Silver Bullet.”

3.6 PIPING INSTALLATION

A. Refer to Division 22 Section "Basic Mechanical Materials and Methods" for basic piping installation.

B. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping installation require written approval from authorities having jurisdiction. File copy of written approval with Architect before deviating from approved working plans.

C. Use only approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes. Bushings shall not be used.

D. Install flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 and larger connections. Not required on grooved connections.

E. Install "Inspector's Test Connections" for each sprinkler system, sized and located according to NFPA #13 requirements. Install main drain test connection at location that will permit full flow discharge for a time sufficient to allow for proper testing of water supplies, without flooding or water damage.

F. Install sprinkler piping to avoid excessive auxiliary drains. Provide auxiliary drains as required for complete drainage of trapped piping sections.

G. Install sprinkler zone control valves, test assemblies, and drain risers adjacent to sprinkler risers when sprinkler branch piping is connected to sprinkler risers.

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H. Install ball drip valves to drain piping between fire department connections and check valves. Drain ball drips to floor drain or outside building.

I. Install alarm devices in piping systems.

J. Hangers and Supports: Comply with NFPA #13 for hanger materials and installation. Hangers, hanger rods and attachments must be capable of supporting five (5) times the weight of the water filled pipe, plus 250 pounds minimum, at each point of hanging. Piping shall be supported from building structure only, and shall not be hung from ductwork, conduit runs or other piping. Install piping straight and true, parallel with building walls, without dips or sags. Piping shall bear evenly on all pipe hangers. Provide complete details of earthquake bracing and flexible couplings consistent with the requirements of the seismic zone of the project location.

K. Install piping with grooved joints according to manufacturer's written instructions. Construct rigid piping joints, unless otherwise indicated.

L. Install pressure gages on system risers and at each sprinkler test connection. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

3.7 SPECIALTY SPRINKLER FITTING INSTALLATION

A. Install specialty sprinkler fittings according to manufacturer's written instructions.

3.8 VALVE INSTALLATION

A. Refer to Division 22 Section "Valves" for installing general-duty valves. Install fire-protection specialty valves, trim, fittings, controls, and specialties according to NFPA #13, manufacturer's written instructions, and authorities having jurisdiction.

B. Gate/Butterfly/Valves: Install fire-protection-service valves supervised-open, unless noted otherwise, located to sectionalize system and control sources of water supply, except from fire department connections. All sectional control valves shall be installed in accessible locations.

1. Provide drains at all sectional control valves. Pipe drains to an acceptable location, capable of accepting full flow discharge without flooding or damage. Provide permanent identification signs indicating portion of system controlled by each valve, according to NFPA#13 requirements.

C. Install check valve in each water-supply connection. Install UL listed fire protection backflow preventers instead of check valves in potable-water supply sources.

D. Riser Check Valves: Install valves in vertical position unless noted otherwise, for proper direction of flow.

E. Install standpipe hose valves at all locations as required by NFPA 14, NFPA 101, the Delaware State Fire Prevention Regulations and where indicated on the drawings. Installation shall be in accordance with NFPA 14.

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3.9 SPRINKLER APPLICATIONS

A. General: Only new sprinklers shall be installed, according to their listing requirements. Ornamental finishes shall be factory applied only. Position sprinkler deflectors at the same elevation, parallel with ceiling plane.

B. Use sprinklers according to the following applications:

1. Rooms without Ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Pendent, sprinklers.
3. Wall Mounting: Sidewall sprinklers.
4. Spaces Subject to Freezing: Upright; pendent, dry-type; and sidewall, dry-type sprinklers.
5. Special Applications: Use quick-response sprinklers where indicated.
6. Sprinkler Finishes: Use sprinklers with the following finishes:

a. Upright, Pendent, and Sidewall Sprinklers: White-plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

3.10 SPRINKLER INSTALLATION

A. Install sprinklers in patterns indicated. Install sprinklers in suspended ceilings in center of acoustical panels and tiles.

1. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical panels, and quarter points of the long dimension.

B. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers with water supply from heated space,

C. Install approved sprinkler guards at all sprinklers installed below 7’-6”, or where mechanical damage is possible.

D. Install sprinklers in accordance with manufacturer’s requirements.

3.11 CONNECTIONS

A. Install ball drip valves at each check valve for fire department connection, Route drain pipe to floor drain or outside building.

B. Connect piping to specialty valves, specialties, fire department connections, and accessories.

C. Connect alarm devices to sprinkler systems.

3.12 LABELING AND IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA #13, Division 22 Section "Basic Mechanical Materials and Methods", and the Delaware State Fire Prevention Regulations.

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3.13 FIELD QUALITY CONTROL

A. Provide a flanged spool section of pipe and a temporary conical type strainer on the incoming fire protection water service, before the building fire protection and sprinkler system equipment (backflow preventer, fire pump, etc.), for the fire protection system during installation. Prior to the final commissioning, remove the strainer and reinstall flanged spool section.

B. Flush, test, and inspect sprinkler piping according to NFPA #13, "System Acceptance" Chapter.

C. Replace piping system components that do not pass test procedures and retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.

D. Report test results promptly and in writing to Architect and authorities having jurisdiction.

3.14 CLEANING

A. Clean dirt and debris from sprinklers, remove protective covers used during painting.

B. Remove and replace sprinklers having paint other than factory finish.

3.15 PROTECTION

A. Protect sprinklers from damage until Substantial Completion.

3.16 COMMISSIONING

A. Verify that specialty valves, trim, fittings, controls, and accessories are installed and operate correctly.

B. Verify that specified tests of piping are complete.

C. Verify that damaged sprinklers and sprinklers with paint or coating not specified are replaced with new, correct type.

D. Verify that sprinklers are correct types, have correct finishes and temperature ratings, and have guards as required for each application.

E. Verify that fire department connections have threads compatible with local fire department equipment.

F. Fill wet-pipe sprinkler piping with water.

G. Fill antifreeze system with proper antifreeze/water mixture and verify mixture after fill.

H. Adjust operating controls and pressure settings.

I. Coordinate with fire alarm tests. Operate alarm devices with water, as required to demonstrate proper function.

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J. Provide a flow test for record on the site fire hydrants nearest the building regardless of the previous date. Data to be included below.

K. Provide an 8-1/2" x 11" drawing in "pdf" format for the Owner, Local Fire Department and the Fire Marshal's Office. Data required on drawing shall indicate the following:

1. Name, address and location of the building.
2. The location of all fire suppression system control valves.
3. The location of all fire department connections for all fire suppression systems.
4. The location of the fire alarm control pane and annunciation panel.
5. The location of all site fire hydrants.
6. Main entrance and exits.
7. Name, and telephone numbers of responsible personnel for responding during emergencies.

3.17 SYSTEMS ACCEPTANCE AND TESTING

A. Notify the Authority Having Jurisdiction, the Owner's representative, and Architect and Engineer of time and date of scheduled testing. Provide minimum of 5 day prior notice of testing to allow for witnessing.

B. Perform all required system testing and acceptance requirements on the new (and modified) system installations in accordance with NFPA 13, 14, & 25, the Delaware State Fire Prevention Regulations, the Authorities Having Jurisdiction (AHJ) requirements and all other local codes and ordinances. At a minimum provide the following:

1. Perform all acceptance requirements per the codes; pipe flushing, inspections, etc.

2. Perform all operational and functional tests of systems and equipment required by the codes and equipment manufacturers.

3. Perform hydronstatic pressure test on new (and modified) above ground systems piping in accordance with NFPA 13. New system shall be tested to 50 psi over normal system working pressure (minimum 200 psi) for 2 hours without leaks.

4. Perform hydrostatic pressure testing on new (and modified) underground systems piping in accordance with NFPA 13 and 24. All piping and appurtenances subject to working pressure shall be tested to 50 psi over nroaml system working pressure (minimum 200 psi) for 2 hours without visible leaks and/or no more than a 5 psi pressure loss.

C. Provide all required reports, records and documentation, to the owner, engineer and authority having jurisdiction prior to or at the completion of the project. At a minimum provide the following:

1. Completed and signed "Contractor's Material and Test Certificate for Aboveground Piping' for each system.

2. Completed and signed "Contractor's Material and Test Certificate for Underground Piping."

D. Prior to placing systems in final service, provide a final inspection of new and/or modified systems to ensure item such as protective caps & strapes have been removed or put in place,

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escutcheons have been install, penetrations seals have been provided, ceiling tiles have been replaced, etc.

3.18 DEMONSTRATION

A. Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.

B. Schedule demonstration with Owner with at least seven days' advance notice.

END OF SECTION

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SECTION 21 01 71

FIRE PUMP – ELECTRIC

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 shall include all work necessary and/or required and furnish all materials and equipment for construction of a complete automatic fire pump system for the building. Such work includes but is not limited to the following:

1. Furnish and install where shown on plans 4-383-7C Aurora Fire Pump System(s) complete with pump, electric motor driver, controller and accessories. The pumping unit shall be listed by Underwriters' Laboratories, Inc. and/or shall be fully approved by the Associated Factory Mutual Fire Insurance Companies, where applicable. The pumping unit shall meet all requirements of the National Fire Protection Association Pamphlet No.20. The Fire Pump shall be designed to deliver 400 G.P.M. when operating at 40 PSIG. The pump shall also deliver not less than 150% of rated capacity at a pressure not less than 65% of rated pressure. The shut off pressure shall not exceed 140% of rated pressure. Suction pressure is 20 PSIG. The pump shall operate at a maximum synchronous speed of 3500 R.P.M.

2. Include all associated valves, piping and equipment so that the fire pump will function as a unit in compliance with NFPA 20. The fire pump piping arrangement will include a water supply bypass arrangement.

3. Included in this section:

   Fire Pump and Driver Package
   Electric Jockey Pump
   Related Controllers and Transfer Switch
   Fire Pump Accessories

1.3 REFERENCE STANDARDS

A. Refer to Section 210000 for a general description of requirements applying to this section.

B. NFPA 20: Installation of Centrifugal Fire Pumps.

C. NFPA 70: National Electric Code

D. UL: Fire Protection Equipment Directory.

E. UL 448: Pumps for Fire Protection Service

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F. UL 1478: Fire Pump Relief Valves

G. UL1004-5: Standard for Fire Pump Motors

1.4 QUALITY ASSURANCE

A. Refer to Section 220010 and 210170 for a general description of requirements applying to this section.

B. Contractor shall provide new and complete fire pump system in satisfactory operating conditions which shall conform to requirements of the following:

1. NFPA Pamphlet 20
2. Delaware State Fire Marshal's Office
3. Owner's Insurance Agency

C. Submit working drawings to the Fire Marshal's Office and obtain approval before beginning work.

1.5 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 220000.

B. Submit shop drawings with Fire Marshal's approval and descriptive data, complete with product designation for the following:

1. Pump layout
2. Associated piping and equipment
3. Dimensional data
4. Weights
5. Clearances
6. Method of assembly

C. Submit complete pump layout indicating location of fire pump by dimensions from walls, pipe size, and locations of valves, and accessories, with Fire Marshal approval.

D. Product Data: Provide manufacturer's literature including general assembly, pump curves showing performance characteristics with pump and system, operating point indicated, NPSH curve, controls, wiring diagrams, and service connections.

E. Manufacturer's Installation Instruction: Include start-up instructions for the fire pump.

F. Manufacturer's Certificate: Certify that fire pump meet or exceed specified requirements at specified operating conditions.

G. Field Reports: Indicate summary of hydrostatic test and field acceptance tests performed in accordance with NFPA 20.

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1.6 OPERATION AND MAINTENANCE DATA

A. Operation Data: Include manufacturer's instructions, start-up data, and trouble-shooting checklists for pumps and controllers.

B. Maintenance Data: Include manufacturer's literature, cleaning procedures, replacement parts lists, and repair data for pumps, drivers and controllers.

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.

1.8 DELIVERY, STORAGE AND HANDLING

A. Accept fire pumps and components at site in factory packing. Inspect for damage. Comply with manufacturer's rigging and installation instructions.

B. Protect fire pump and components from physical damage, including effects of weather, water and construction debris.

C. Provide temporary inlet and outlet caps, and maintain in place until installation.

1.9 MAINTENANCE SERVICE

A. Furnish service and maintenance of fire pump, driver and controller for one year from date of substantial completion.

B. Furnish service and maintenance of jockey pump, driver and controller for one year from date of substantial completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with specification requirements, manufacturers offering fire pump system equipment shall be limited to the following:

1. Centrifugal Pump (Main Pump)

   Aurora (Basis of Design)
   Patterson
   Fairbanks
   AC Fire Pump

2. Controller

   Firetrol
   Joslyn/Clark
   Tornatech

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Metron
Eaton

3. Jockey Pump

Aurora (Basis of Design)
Grundfos

4. Flow Meter System

Aurora/GVI
Aeroquip
Victaulic
Viking

B. Manufacturers identified above shall be selected for this project only as required from Owner's standardization list. No other manufacturers shall be permitted.

2.2 VERTICAL BASE MOUNTED INLINE PUMP

A. The fire pump shall be Aurora 383 vertical inline mounted size 4-383-7C bronze fitted, single stage, centrifugal pump, or approved equal.

B. The driver shall be a vertical, open drip-proof (or T.E.F.C.), ball bearing type, AC, induction, squirrel cage "P" face motor: 15 HP maximum, 3500 RPM vertical shaft wound for 480 volts, 3 phase, 60 (50) Hertz. The motor shall be of such capacity that 115% of the full-load ampere rating shall not be exceeded at any condition of pump load. Locked rotor current shall not exceed the values specified in NFPA Pamphlet No.20.

C. The pump shall be fitted with Teflon lantern ring when the suction pressure is 30 psi or less.

D. Casings shall be of cast iron having a minimum tensile strength of 35,000 P.S.I. Bearing housing supports, and suction and discharge flanges shall be integrally cast with the lower half of the casing. Removal of the upper half of the casing must allow the rotating element to be removed without disconnecting the suction and discharge flanges.

E. Impellers shall be of the enclosed type and shall be of vacuum cast bronze. Impellers shall be dynamically balanced, keyed to the shaft, and held in place with threaded shaft sleeves.

F. The pump shaft shall be made of SAE 1045 Steel or equal, accurately machined to give a true running rotating element. Shaft shall be protected by bronze sleeves which are key locked and threaded so that the sleeves tighten with the rotation of the shaft. An o-ring shall seal between the impeller hub and the shaft sleeve to protect the pump shaft.

G. Pump shall be equipped with renewable bronze casing rings so designed that hydraulic pressure will seat them against a shoulder in the pump case around the full periphery of the wearing ring. The wearing rings will be locked by dowelling to prevent rotation. The rotating element uses heavy duty grease lubricated ball bearings and shall be equipped with water slingers. Bearing housings shall be so designed to flush lubricant through the bearing. All pumps where the suction pressure is expected to average 40 P.S.I. or below, shall be provided with a lantern ring connected to the pressure side of the

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pump by a cored passage in the parting flange of the pump. Stuffing boxes shall be equipped with split bronze packing glands designed for easy removal for packing inspection and maintenance.

2.3 FIRE PUMP ACCESSORIES

A. The fire pump unit shall include the following accessories, as required by NFPA standards (depending on the conditions under which the pumps are to be installed).

1. OS&Y Gate valves with valve tamper switches (Butterfly valves with integral tamper switch may be used where permissible by code.)
2. Fire pump full size bypass fitted with OS&Y valves with tamper switches or butterfly valves with tamper switches and check valve.
3. Flow metering device
4. Eccentric tapered suction reducer
5. Concentric tapered discharge increaser
6. Discharge tee
7. Base elbow
8. Hose valves
9. Caps and chains
10. Hose valve header
11. Blind flange
12. Suction and discharge pressure gauges, 4-1/2” dia. dial with snubber, valve cock and lever handle.
13. Main relief valve (optional for electric)
14. Circulation relief valve
15. Relief cone – enclosed (optional for electric)
16. Automatic air release valve
17. Splash shield (electric drive only)
18. Balldrip valve
19. Coupling guard

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2.4 FIRE PUMP CONTROL EQUIPMENT FOR ELECTRIC DRIVE

A. The Fire Pump motor control shall be U.L. (Underwriters Laboratories) Listed and/ or F.M. (Factory Mutual) Approved, where applicable. It shall be completely assembled, wired and tested by the control manufacturer before shipment from the factory, and shall be labeled "Fire Pump Controller." The controller shall be located as close as practical and within sight of the motor. The controller shall be so located or protected that it will not be injured by water escaping from the pump or connections. The controller shall be of the combined manual and automatic, (across-the-line) (primary resistor) (partwind) (limited service) (wye delta) type, and shall be complete with:

1. Disconnect switch - externally operable, quick-break type.

2. Circuit breaker - time delay type with trips in all phases set for 300% of the motor full-load current. The interrupting capacity of circuit breaker shall be 10,000 asymmetrical amperes.

3. Motor starter - across-the-line type capable of being energized automatically through the pressure switch or manually by means of an externally operable handle.

4. Pressure switch set to cut in at 90 p.s.i.g. and out at 100 p.s.i.g.

5. Running period timer - set to keep motor in operation, when started automatically, for a minimum period of one minute for each 10 HP motor rating, but not to exceed 7 minutes.

6. Pilot lamp - to indicate circuit breaker closed and power available.

7. Ammeter test link and voltmeter test stud.

8. Alarm relay - to energize an audible or visible alarm through an independent source of power to indicate circuit breaker open or power failure.

9. Manual selection station - a two position station shall be provided on the enclosure marked "Automatic" and "Non-automatic."

10. Means shall be provided on the Controller to operate an alarm signal continuously while the pump is running. Control equipment shall meet all requirements of NFPA No.20.

11. The following alarm and trouble conditions shall be remotely annunciated/monitored through the facilities fire alarm system:

    a. Fire pump running.
    b. Phase reversal-loss of phase
    c. Controller main switch turned to OFF or manual position.
    d. Controller power transfer switch position.

B. Provide the controller with a U.L. (Underwriters Laboratories) Listed and F.M. (Factory Mutual) Approved automatic power transfer switch for fire pump service. The power transfer switch shall be of the same manufacturer of the controller, fully compatible with the fire pump controller. Alternate power to the switch shall be from the facilities emergency back-up power generator system and shall be complete with all the requirements in accordance with NFPA 20 for power transfer switches.

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2.5 PRESSURE BOOSTER (JOCKEY) PUMP

A. Pump shall be a centrifugal close-coupled, vertical type pump, cast iron, bronze fitted with stainless steel shaft, mechanical seals, impeller wear rings.

B. The motor characteristics shall be based on a vertical open dripproof motor for 208 volts, 3 phase, 60 cyce, 3600 RPM, complete with energy efficiencies and power factor corrections as noted in Section 220010.

C. The gpm and TDH selection shall be based on the proposed design capacity related to the fire pump and requirements of the most remote standpipe as calculated.

D. Jockey pump controller shall be complete with fusible disconnect starters, control circuit transformer, pressure switch start button and selector switch, all prewired and housed within a NEMA 2 enclosure.

2.8 FIRE PUMP FLOW METER TEST SYSTEM

A. Furnish and install venturi fire pump flow meter system as manufactured by Aeroquip Corporation or equal. This shall be a coordinated system, including individual Venturi Flow Stations and fixed mounted Master Meter, supplied by one manufacturer.

B. The primary flow element shall be a venturi selected from manufacturer's engineering data to permit prescribed flow at a minimum head loss. For maximum accuracy and minimal length of 1.6x pipe diameter. The beta ratio shall be selected to allow for a differential pressure compatible with the meter as specified herein and ensure a properly calibrated system accuracy within 2% throughout the entire range. This accuracy shall be obtained with as little as five (5) pipe diameters of straight pipe upstream and two (2) diameters downstream from the Venturi. The Venturi shall be furnished with two (2) accurately located built-in sensing taps, nipples, shut-off valves and quick connect couplings. Venturie shall be complete with identification tag on chain, giving P/N, pipe size, beta ratio, Venturi style, flow rating, date of manufacture and FM approval.

C. Venturi station shall consist of one-piece cadmium-plated cast steel with weld neck or flanged ends. If the size is larger than 8", it shall be cadmium-plated fabricated steel, with weld or flanged ends.

D. Venturi size and beta ratio shall be selected to accurately measure throughout the range of 50% to 200% of the rated capacity of the fire pump for which the flow meter shall be used.

E. The indicating meter shall be fixed mounted type with 6" round dial, 270 deg. indication. It shall be the dual rupture-proof liquid filled bellows type with integral temperature compensation. The meter shall have over-range protection in either direction equal to the working pressure equivalent of the instrument housing (250 psig @ +250° F). The accuracy of the meter shall be no less than 0.5% full scale. The meter case shall be waterproof and coated with appropriate paint. It shall have external zero and range adjusting screws and life-long lubrication. Scale shall be calibrated to read directly in gpm, and shall be scaled to read up from 0-200% of rated pump capacity.

F. Stationary or fixed mounted meters shall be furnished with necessary mounting brackets, bleed-off and shut-off valves, color coded connectors, fittings and assembly piping.

G. Meter shall have a label attached identifying the meter number and range.

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2.9 FIRE PUMP REMOTE ALARM PANEL

A. The alarm panel shall be a factory assembled, wired and tested unit and shall conform to all the requirements of the latest edition of NFPA 20 National Electrical Code.

B. The alarm panel shall be listed by UL, approved by Factory Mutual Research Corp. and certified by the Canadian Standards Association.

C. The alarm panel shall be low voltage DC and make use of printed circuit boards which can be easily wired together for future additional alarms.

D. The alarm panel shall have individual pilot lights to indicate its alarm condition which shall remain lighted until the alarm condition has been corrected. The alarm panel shall also have an audible alarm which shall sound when the alarm conditions occur and may be silenced by pressing a silence alarm button.

E. Each alarm initiation shall be subsequent to any and all previous alarm conditions so that the silence button acknowledgment of any one alarm will not prevent the audible alarm sounding on successive alarm conditions.

F. The alarm panel shall have a “Push-to-test” pushbutton for manually testing all pilot lights, audible alarms and output circuits. All alarm pilot lights and pushbuttons shall be plainly marked for identification.

G. The alarm panel shall be NEMA Type 2 dripproof for indoor wall mounting.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install all equipment, devices, etc., in strict accordance with manufacturer’s instructions and code compliances.

B. Provide access space around pumps for service. Provide no less than minimum as recommended by manufacturer.

C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For base-mounted pumps, provide supports under elbows on pump suction and discharge.

D. Provide drains for bases and seals, piped to and discharging to the floor drain.

E. Provide vibration isolators for the installation.

F. Provide a fire pump test header with the number of nozzles and valves as required for the fire pump.

G. Lubricate pumps before start-up, if required by manufacturer.

H. Qualified manufacturer’s representative shall check, align and certify pumps prior to start-up.

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3.2 FIELD QUALITY CONTROL/TESTS

A. The pump and electric motor shall be thoroughly shop-tested by the respective manufacturers as required by NFPA Pamphlet No.20. The control panel shall also be tested as a unit. All such tests shall be conducted prior to shipment.

B. The pump, driver, controller and all accessories shall be purchased under a unit contract. The pump shall be given a complete performance test with POSITIVE SUCTION PRESSURE. A certified performance curve shall be prepared and submitted. Pumps shall also be hydrostatically tested to twice the shut off pressure, but in no case less than 250 lbs. per sq. inch.

C. The pump manufacturer shall assume unit responsibility and shall provide the services a factory trained representative to supervise and/or be available to conduct final field acceptance tests.

D. Perform field acceptance testing under the provisions of NFPA 20.

E. Hydrostatically test the entire system and piping in accordance with NFPA 20.

F. Tests shall be witnessed by Delaware State Fire Marshal, Owner's Representative and the A/E Representative.

END OF SECTION

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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 Architect/Engineer 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.

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B. Refer to work related to Plumbing and Fire Protection as shown on the following contract drawings:

Architectural & Structural
HVAC
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. 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. Develop overall coordination drawing (all trades) and submit for review prior to fabrication/installation.

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. Coordination of Trades in the Field: The Sheet Metal Contractor shall take precedence and, therefore, shall develop his shop drawings first. These then will be used to overlay the other trades. Next shall be the mechanical piping, plumbing, fire sprinkler and electrical in the order stated. Drawings shall be 3/8" in scale. Initial meeting of contractors shall be convened prior to start of drawings to work out layout, breakdown of building and other details. All drawings shall be completed in CAD with a format compatible and convertible to DWG files. At the end of the effort, each contractor shall provide a full set of shop drawings to each of the other contractors and three sets to the construction manager. Devices requiring access for maintenance shall not be infringed upon by adjacent trades. Coil pull allowances shall be shown on drawings.

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.

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:

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- All fixtures, equipment and associated devices so listed on the Fixture Schedule on Drawing.
- Insulation
- All specified piping systems.
- All specified valves.
- Gauges and thermometers
- Recirculating pump.
- 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.

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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.

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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.

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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. Gas piping shall be blown out with clean compressed air or inert gas.

F. 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.

G. 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.

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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.

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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.

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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 be10’-0”.

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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 of 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

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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.

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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.

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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.

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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

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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:

New Castle County Department of License and Inspection
New Castle County Department of Sewers
International Plumbing Code
Delaware State Fire Marshal's Office
NATIONAL Plumbing Code
International Plumbing Code (All applicable sections)
International Mechanical Code (All applicable sections)
International Fuel Gas Code (All applicable sections)
Gas Utility Company
Water Company
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:

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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 STEEL PIPE & FITTINGS

A. Pipe: ASTM A-53, seamless, Schedule 40.

B. Fittings:

1. Cast iron, threaded, 175 psi, ANSI B-16.4.
2. Malleable iron, threaded, ASA B 16.3.
3. Steel, socket weld, ASTM A-53.
4. Wrought iron, socket weld, ASTM A-72.

C. Thread tape shall be teflon tape, 3 mils minimum thickness. Teflon tape shall not be permitted for use on gas piping systems.

D. See Section 220130 for Gas Piping Systems.

2.2 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.

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6. Protection of all below-grade storm and sanitary shall be in accordance with IPC Section 305.

7. All Kitchen and Boiler Room below slab piping shall be extra heavy schedule cast iron only. PVC not allowed.

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.

2.3 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.

2.4 DUCTILE IRON PIPE

A. Pipe: Ductile iron, ANSI A-21.51, ANSI/AWWA C151.

B. Joints: Rubber gasket, ANSI A-21.11, ANSI/AWWA C111.

C. Fittings: Mechanical joint, ANSI/AWWA C110, C153 bolt tolerances – AWWA C-111, ASTM A-563.

D. Lining: Cement mortar, ANSI A-21.4, ANSI/AWWA C104.

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2.5 PVC GRAVITY SEWER PIPE

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).

2.6 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. Aboveground – Drainage & Vent (Sanitary) IPC Table 202.1

1. ASTM D 2665
2. ASTM D 2949
3. CSA CAN/CSA B 181.2
4. ASTM F 1488
5. ASTM F-81

B. 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

C. 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)

D. Fittings:

1. ASTM D 3311
2. ASTM D-2665
3. ASTM F-1866

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E. 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

F. 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.

G. Uniformity: To insure installation uniformity, all piping components shall be of one manufacturer.

2.7 POROUS CONCRETE PIPE

A. Pipe & Fittings: Porous concrete drain pipe, A.A.H.O. designation M176.

B. Joints: Interlocking tongue and groove.

2.8 REINFORCED CONCRETE PIPE AND FITTINGS

A. Pipe & Fittings: Reinforced concrete, ANSI/ASTM C-75, Class 2.

B. Joints: Modified tongue and groove, with compression gasket, ANSI/ASTM C-443.

2.9 POLYPROPYLENE PIPE & FITTINGS

A. Pipe & Fittings: Polypropylene flame retardant ASTM D-2146 Schedule (40) (80).

B. Joints: (Aboveground)

1. Mechanical
2. Fusion welded socket ends.

C. Joints: (Below ground) Fusion welded - socket ends

2.10 PLENUM RATED PVDF PIPE & FITTINGS/CORROSIVE WASTE DRAINAGE SYSTEM

A. Pipe & Fittings: Polyvinyllidene fluoride (PVDF), ASTM F-1673, pipe shall be marked with “UL” to indicate compliance with UL723 (ASTM E84).

B. Joints (Aboveground)

1. No hub, plain end, outerban, nuts and bolts per ASTM B117.
2. Socket Fusion: ASTM 2657, ASTM D3222.

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2.11 FLOWGUARD GOLD CPVC PIPE

A. Scope: This specification covers the manufacturing requirements for CPVC SDR 11 Copper Tube Size (CTS) pipe and fittings. Both the pipe and fittings are manufactured in North America and meet or exceed the requirements set forth by the American Society for Testing Materials (ASTM) and ANSI/NSF Standards 14 and 61.

B. CPVC Materials: FlowGuard Gold® CPVC pipe and fittings are extruded/molded from CPVC compounds manufactured by Lubrizol. The pipe compound meets cell class 24448 and the fitting compound meets cell class 23447 as defined by ASTM D1784. Both the pipe and the fitting compounds are certified by NSF International for use with potable water.

C. Dimensions And Properties:

Dimensions, tolerances and physical properties meet or exceed the requirements of ASTM D2846.

D. Solvent Cement: All socket type joints shall be assembled employing solvent cements that meet or exceed the requirements of ASTM F493. The standard practice for safe handling of solvent cements shall be in accordance with ASTM F402. Solvent cement shall be listed by NSF International for use with potable water, and approved by the FlowGuard Gold® pipe and fittings manufacturers.

E. Flame And Smoke Requirements: Water filled FlowGuard Gold® pipe and fittings (1/2" through 2") tested in general accordance with UL 723/ASTM E 84 (NFPA 255 and UBC 8-1) meet the 25/50 flame and smoke requirement and shall be permitted to be installed in return air plenums. Test reports from a third party testing laboratory shall be obtained and made available upon request.

F. Marking: The marking on the CPVC pipe and fittings meet the requirements of ASTM D2846 and state the pipe/fitting manufacture's name or trademark, the material designation, the size, the NSF mark for potable water and the ASTM designation (ASTM D2846).

2.12 CORZAN CPVC PIPE

A. Scope: This specification covers the manufacturing requirements for CPVC Schedule 80 Iron Pipe Size (IPS) pipe and fittings. Both the pipe and fittings are manufactured in North America and meet or exceed the requirements set forth by the American Society for Testing Materials (ASTM) and ANSI/NSF Standards 14 and 61.

B. CPVC Materials: Corzan® CPVC pipe and fittings are extruded/molded from CPVC compounds manufactured by Lubrizol. The pipe compound meets cell class 24448 and the fitting compound meets cell class 23447 as defined by ASTM D1784. Both the pipe and the fitting compounds are certified by NSF International for use with potable water.

C. Dimensions and Properties: Dimensions, tolerances and physical properties meet or exceed the requirements of ASTM Standards F441 for pipe, F439 for socket fittings and ASTM F437 or F439 for threaded fittings. Threaded fittings have taper pipe threads in accordance with ASTM F1498. Unions and flanges meet or exceed the requirements of ASTM F1970.

D. Solvent Cement: All socket type joints shall be assembled employing solvent cements that meet or

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exceed the requirements of ASTM F493. The standard practice for safe handling of solvent cements shall be in accordance with ASTM F402. Solvent cement shall be listed by NSF International for use with potable water, and approved by the Corzan® pipe and fittings manufacturers.

E. Flame and Smoke Requirements: Water filled Corzan® pipe and fittings (1/2" through 6") tested in general accordance with UL 723/ASTM E 84 (NFPA 255 and UBC 8-1) meets the 25/50 flame and smoke requirement and shall be permitted to be installed in return air plenums. Test reports from a third-party testing laboratory shall be obtained and made available upon request.

F. Marking: The marking on the CPVC pipe meet the requirements of ASTM F441 and the marking on the fittings meets the requirements of ASTM Standards F437, F438 or F1970. The pipe and fittings markings state the pipe/fitting manufacture's name or trademark, the material designation, the size, the NSF mark for potable water and the ASTM designation.

G. To ensure compliance with Green Building Design and Construction under LEED Credit 4.1 for Low-Emitting Materials (adhesives and sealants), all interior use adhesives, sealants and sealant primers shall comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168. All primers and cements used for joining CPV and CPVC piping shall comply with the following Volatile Organic Compound (VOC) limits when calculated according to 40 CFR 59, subpart D (EPA Method 24):

PVC welding	-510 g/L less water
CPVC welding	-490 g/L less water
Adhesive Primer of Plastic	-550 g/L less water

H. Valves - Plastic PVC & CPVC: Valves listed below shall be for domestic water systems and comply with ASTM Standard D 1784, Rigid PVC and CPVC compounds. Classes 12454 (Type 1, Grade 1) PVC and 23447 (Type 4, Grade 1) CPVC.

All PVC and CPVC Valves are listed by the NSF International to NSF/ANSI Standard 14: Plastic Piping System Components and Related materials. This independent third-party agency certifies that products and materials bearing the 'NSF-pw' marking are regularly tested to comply with ASTM F 1970 Standard Specification for Special Engineered Fittings, Appurtenances or Valves for use in Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Systems, as well as, certifying these products conform to the requirements of NSF/ANSI Standard 61: Drinking Water System Components-Health Effects.

Ball and Ball-Check Valves are 100% pressure tested for shell and seat leaks in accordance with quality standards established by NIBCO Engineering. The rejection point is a leak greater than 60 cc per minute.

All True Union-Tru-Bloc Ball Valves, True Union Check Valves, Model-B Butterfly Valves, Chemcock Valve, Needle Valve, Angle and Y-Pattern Valves are manufactured and assembled silicone free. Lubricants are occasionally used to assemble these valves, but these lubricants contain no silicone.

Butterfly Valves shall be assembled using a lubricant containing silicone.

The above listed valves shall be manufactured in an ISO 9001:2000 certified facility.

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Valves-Plastic Manufacturers - Subject to compliance with requirements, provide valves of one of the following:

Chemtrol
Haywood
Ipex

2.13 GLASS PIPE AND FITTINGS

A. Pipe & Fittings: Borosilicate glass, ANSI/ASTM C-599.

B. Joints: Stainless steel couplings.

2.14 VITRIFIED CLAY PIPE

A. Pipe & Fittings: Extra strength, hub and spigot pattern ASTM C-200.

B. Joints: Double ball polyvinyl chloride plastic type similar to "Wedge Lock" Type 1. Joints shall be factory bonded to pipe.

2.15 CORRUGATED METAL PIPE

A. Pipe:

1. 24" diameter and smaller shall be 16 U.S. gauge steel.
2. 30" diameter and larger shall be 14 U.S. gauge steel.
3. All piping shall be completely bituminous coated on the interior and exterior and shall have a paved invert for 25% of its periphery.

B. Joints: Standard coupling bands and bolts as furnished by the pipe manufacturer.

2.16 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 seats, 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.

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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.

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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.

2.17 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.

2.18 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.

2.19 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

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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.

2.20 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.

2.21 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.

2.22 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, dripproof, Class B temperature rise based on 40 deg. C maximum ambient temperature.

E. Motors installed outdoors and exposed to moisture shall be totally enclosed, fan cooled, Class B

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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	6-Pole	4-Pole	2-Pole	6-Pole	4-Pole	2-Pole
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
25	93.0	93.6	91.7	93.0	93.6	91.7
30	93.6	94.1	91.7	93.0	93.6	91.7
40	94.1	94.1	92.4	94.1	94.1	92.4
50	94.1	94.5	93.0	94.1	94.5	93.0
60	94.5	95.0	93.6	94.5	95.0	93.6
75	94.5	95.0	93.6	94.5	95.4	93.6
100	95.0	95.4	93.6	95.0	95.4	93.6
125	95.4	95.4	94.1	95.0	95.4	94.1
150	95.4	95.8	94.1	95.8	95.8	95.0
200	95.4	95.8	94.1	95.8	96.2	95.0

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.

2.23 POWER FACTOR CORRECTION AT MOTORS

A. All motors 3 HP and above shall be provided with capacitors sized as recommended by the motor manufacturer to correct the full load running current of the motor to 95 PF, or to the maximum PF

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value as determined by the total capacitance which the particular motor design and duty can safely accommodate. Capacitors shall be wired to the load side of the starting contacts ahead of the overload protective devices so that motor and capacitor are switches simultaneously.

B. Capacitors for motors with starters located in a motor control center shall be furnished and mounted on the rear of the motor control center by the Electrical Contractor.

C. Where the motor, starter, and wiring area integral part of a packaged type equipment assembly, the capacitors shall be furnished, wired and mounted on the equipment by the manufacturer.

D. Multi-speed motors with two or more windings shall have capacitors on each speed (or winding) arranged with auxiliary contactors so that when that winding is not energized the capacitor is disconnected.

E. For motors connected to high inertia loads, a time delay device shall be provided to prevent restart of that motor until its speed has been reduced and the charge remaining in the capacitor has reached a safe level for restart.

F. Power capacitors shall be 3 phase, industrial grade, mounted in a dust tight enclosure with removable shroud. Sprague Power Capacitors, Square D, General Electric or approved substitute.

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.

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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.

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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 WELDING

A. All concealed and inaccessible black steel piping shall be welded.

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B. All black steel piping larger than 2 inch shall 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 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. Silver brazing alloy shall be equal to and shall be used for joints in:

1. Medical Gas Piping (All Systems)
2. Medical Vacuum Piping

E. Brazed Joints:

1. All brazed joints shall be cleaned. An approved flux shall be applied; joint filler metal shall conform to AWS A5.8.

2. Flux shall meet AWS Standard A5.31, Type F83-A or F83-C.

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F. 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
5. Plant compressed air

G. Lead-Tin (50-50) solder or any solder containing lead shall NOT be used or permitted for joint connections on this project.

H. Where the silver brazing is performed in a confined non-ventilated space, a non-toxic, cadmium-free brazing alloy such as Stay-Brite shall be used instead of Easy-Flo. Bring joint to solder temperature or brazing temperature in as short a time as possible.

I. Form continuous solder bead or brazing filler bead around entire circumference of joint.

J. Wipe excess solder from joint area while solder is still plastic.

K. Solder joints shall be in accordance with IPC Section 605.2, 605.14.3 and ASTM B838. Flux shall conform to ASTM B-813.

3.5 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

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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 605.1[illegible]1. Use caution around combustible material and follow all safety guidelines for open flame during silver brazing.

END OF SECTION

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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. Hot water storage tanks.

6. Exposed waste, trap and wall supplies at all handicap lavatories.

7. 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.

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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. Fiberglass:

1. Material: Preformed fiberglass bonded with resins 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 adhesive closure and vapor sealing of longitudinal joints. Thermal Conductivity: .25 per inch at 100 degrees F. Flame spread of 25 and developed smoke of 50 or less.

2. All Valves and Fittings:

a. Class fiber insert and premolded PVC cover, Manville "Zeston" and "Hi-Lo Temp Inserts" for valves and fittings.

b. Factory molded fibrous glass fitting covering for fittings.

c. Mitered sections of pipe covering for valves.

3. Manufacturers: Johns-Manville, Certain-Teed, Owens-Corning.

B. 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

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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	

C. 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.

D. 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 150ºF.
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.

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H. All electrical heat tracing installations shall be coordinated with the electrical contractor. No insulation shall be installed until the heat trace wiring is completely installed, tested and approved. All insulation materials and installation work shall be the responsibility of the Insulation Contractor.

I. 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.

J. Insulation shall be pushed onto the pipe, never pulled. Stretching of insulation may result in open seams and joints.

K. Tape the ends of the copper tubing before slipping the Armaflex insulation over the new pipes to prevent dust from entering the pipe.

L. 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.

M. 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.

N. 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.

O. 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

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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 o 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 OUTDOORS EXPOSED PIPING

A. All outdoor exposed piping shall be painted with two coats of WB Armaflex Finish. Prior to applying the Finish, the insulation shall be wiped clean with denatured alcohol. The Finish shall not be tinted.

B. All outdoor exposed piping shall have the seams located on the lower half of the pipe.

3.5 EXTERIOR PIPE COVERING

A. Wrapping: Wrap insulation with embossed .016" aluminum jacket.

B. Fastenings: Cover shall be held in place with soft aluminum bands on 12" centers.

C. Valves and Fittings: Weatherproof all valves and fittings.

D. Finish: Apply two coats of vapor resistant mastic reinforced with glass fabric over wrapping.

3.6 PIPE COVERING (FOAMED PLASTIC TYPE)

A. All joints and seams shall be sealed with a compatible adhesive. Approved adhesives are as follows:

Armacel	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.

NOT FOR BIDDING PURPOSES

3.7 PIPE INSULATION – TYPES & THICKNESSES

A. Flexible Closed Cell:

Piping System	Up to 3”	Over 3” to 6”	Over 6”
Cold Water	½”	½”	¾”
Hot Water (120º)	1”	1”	1-1/2”
Hot Water Return (120º)	1”	1”	1-1/2”
Hot Water (140º)	1”	1”	1-1/2”
Hot Water Return (140º)	1”	1”	1-1/2”
Condensate Waste	½”	½”	-
Horizontal Storm (Primary)	½”	½”	¾”
Horizontal Storm (Secondary)	-----Not Required-----		
Underside of Roof Drains	½”	½”	¾”
Branch Waste From EWC’s	½”	---	---
Handicap Lav Waste & Water	½”	---	---
Soil/Waste Piping Above Ceiling	½”	½”	¾”

B. Fiberglass:

Piping System	Up to 3”	Over 3” to 6”	Over 6”
Cold Water	½”	½”	¾”
Hot Water	1”	1”	1-1/2”
Hot Water Return	1”	1”	1-1/2”
Hot Water	1”	1”	1-1/2”
Hot Water Return	1”	1”	1-1/2”
Condensate Waste	½”	½”	---
Horizontal Storm (Primary)	½”	½”	¾”
Horizontal Storm (Secondary)	½”	½”	¾”
Underside of Roof Drains	½”	½”	---
Soil/Waste Piping Above Ceiling	½”	½”	¾”

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 22 00 50

VIBRATION ISOLATION – 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 provision of vibration isolation, devices as specified for items of equipment and piping installed under Plumbing work.

1.3 REFERENCE STANDARDS

A. Refer to Section 22 00 00 for a general description of requirements applying to this section.

1.4 QUALITY ASSURANCE

A. Refer to Section 22 00 10 for a general description of requirements applying to this section.

1.5 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 22 00 00.

B. Submit shop drawings and manufacturer's data sheets of materials specified herein.

C. Submit test reports on installation.

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 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.

NOT FOR BIDDING PURPOSES

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 pad beneath. Clearance space shall be checked to ensure that no scrap, rubbish, hardware, etc., has been left to possibly short circuit isolated base.

E. In connecting isolated Plumbing 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 should be blocked-up with temporary shims to final operating height. When full load is assembled and water is in system, isolators can then be adjusted to take up load just enough to allow removal of shims.

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 Kx/Ky (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.

3. Concrete to be 3000 psi.

B. Piping in Mechanical Room, In-Line Pumps, Suspended Fans & H&V Units:

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.

NOT FOR BIDDING PURPOSES

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. Manufacturers: Amber/Booth, Mason Industries, Vibration Mounting & Controls, Vibration Eliminator, Inc.

END OF SECTION

NOT FOR BIDDING PURPOSES

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 22 00 30 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 22 00 00 is included as work of this section. Refer to Division I.

7. Installation of detectable metallic underground tape for <u>all</u> exterior buried PVC drainage piping.

1.3 REFERENCE STANDARDS

A. Refer to Section 22 00 00 for a general description of requirements applying to this section.

NOT FOR BIDDING PURPOSES

1.4 QUALITY ASSURANCE

A. Refer to Section 22 00 10 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 22 00 00.

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-.046" thick stainless steel bands.

c. PVC Schedule 40 pipe and fittings with solvent cement joints.

2. Kitchen Sanitary Drainage and/or Mechanical Room Sanitary Drainage: All Kitchen and/or Mechanical Room sanitary below slab piping and fittings shall be service weight cast iron hub and spigot fitting with butyl rubber gaskets or hubless fittings with heavy duty couplings (no PVC shall be acceptable).

B. Exterior:

1. Stormwater drainage piping 10 inches and smaller, and all sanitary drainage piping unless otherwise noted on the plans, shall be:

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.

NOT FOR BIDDING PURPOSES

c. Unplasticized PVC sewer pipe and fittings SDR-35.

2. Stormwater drainage piping 12 inches and larger, shall be:

a. Reinforced concrete pipe and fittings.
b. Corrugated metal pipe.
c. As identified on the drawings.

3. Foundation drainage piping shall be:

a. Porous concrete pipe and fittings.
b. Perforated PVC pipe and fittings Schedule 40.

2.2 PIPING ABOVE GROUND

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.

3. PVC pipe and fittings type DWV with solvent cement joint connections. (Not permitted in areas of plenum rated ceilings.)

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. (Not permitted in areas of plenum rated ceilings.)

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 1748 counterflashing fitting, or approved substitute as manufactured by Josam or Zurn. Vents shall terminate 18" above the roof.

2.5 SPECIAL EXPANSION COMPENSATION

A. Special expansion compensation products required for storm, condensate, soil and waste piping systems include the following types:

B. Cast Iron Drainage System Expansion Joints: Cast-iron body, adjustable bronze sleeve, bronze bolts with wing nuts; for vertical installation only.

NOT FOR BIDDING PURPOSES

C. PVC Drainage System Expansion Joints: Factory prelubricated "O" ring expansion joint fitting. Installation must be in strict conformance with manufacturer's recommendations.

D. Available Manufacturers: Subject to compliance with requirements. Manufacturers offering expansion joints which may be incorporated in the work include:

1. Cast Iron Piping Systems - J.R. Smith or approved substitute.
2. PVC Piping Systems – George Fisher or approved substitute.

2.6 BACKWATER VALVES / FLOODGATE

A. Backwater valves (BWV) installed in the interior or exterior building sewer extension shall be all PVC construction materials.

B. The backwater valve shall be in compliance with the latest edition of IPC and UPC Plumbing Codes.

C. Description:

1. The BWV shall be as manufactured in accordance with "ICC-ES" criteria.

2. The BWV shall be 3- and 4-inch diameter backwater valves, shall meet the performance requirements of CSA B181.1 and CSA B181.2. The factory kit consists of a valve body, disc, disc seat, and upper collar. The factory supplied plastic materials conform to NSF 14-99 and ASME A 112.14.1.

3. Removal of the integral lifting device from a buried valve allows above-grade replacement of the disc assembly and reinstallation into the valve body. The integral lifting device is self-aligning, self-seating, and provided with an alignment indicator located within 12 inches (305 mm) of the upper access opening.

4. <u>Floodgate / Backwater Valve Basin</u>

Valve basin must be installed in a ventilated and dry access pit in the horizontal drain line between the building and the sewer main.

Provide access pit of a size that will provide suitable room to inspect and or replace the valve.

Floodgate / backwater valves are approved for storm and sanitary drain systems. Consult with the local plumbing and sewer authority for any additional requirements.

2.7 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:

NOT FOR BIDDING PURPOSES

Floor Drains (all types)

Zurn
Josam
Wade
Watts
Smith
MIFAB

Roof Drains

Zurn
Josam
Wade
Watts
Smith
MIFAB

Cleanouts

Zurn
Josam
Wade
Watts
Smith
MIFAB

Downspout Shoes

Neenah
Zurn
Josam
Wade
Smith
Watts
MIFAB

Interceptors

Zurn
Josam
Wade
Watts
Smith
Woodford
MIFAB

Backwater Valves & Traps (Cast Iron)

Zurn

NOT FOR BIDDING PURPOSES

Josam
Wade
Watts
Smith
Red Valve Co.
MIFAB

Backwater Valve (PVC)

Clean Check, Inc.

Wall Spout Nozzles

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.

NOT FOR BIDDING PURPOSES

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. Connect piping to roof drains and outlets provided in gutters, install rainwater conductors and extend to underground storm building drains as indicated.

B. Underground storm building drains shall be extended from the building, terminating beyond the building wall.

C. Provide exterior clean-out on both sanitary and storm drain mains. Minimum size shall be 4" installed within 5 ft. of the building. (Also see Paragraph 3.5).

D. Connect to exterior downspouts, install cast iron downspout shoes, and extend piping from the building wall.

E. 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.

F. 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.

G. Install storm water drainage piping pitched to drain at minimum slope of 1/8" per foot (1%) for piping 4" and larger.

H. Vertical to horizontal change in direction to be made with long radius fittings.

3.3 INSTALLATION OF ACID WASTE & VENT PIPING

A. Connect to all laboratory equipment requiring acid waste piping, furnish and install traps and extend piping to sanitary drainage piping as indicated.

B. Acid vents shall be extended through the roof, independently of the sanitary system vents.

C. All acid resistant pipe shall be installed in strict accordance with the manufacturers recommendations. The use of solvent cement to dissimilar PVC pipe materials shall not be permitted.

D. All changes in direction of acid 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.

NOT FOR BIDDING PURPOSES

E. 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.

F. Install acid waste 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.

3.4 INSTALLATION OF SPECIAL EXPANSION COMPENSATION PRODUCTS

A. Expansion Joints: Install expansion joints on vertical risers as indicated, and/or as required by International Plumbing Code.

B. PVC piping systems in multi-story (four stories or more) shall require "O" ring expansion joints to compensate for length changes in soil, waste and vent stacks. Expansion joints shall be required at every floor level for soil and waste stack and at alternate floors for vent stacks and rainwater conductors.

3.5 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.

B. Exterior cleanouts shall be installed with access covers flush to grade. The cleanout shall be installed within a concrete pad, 18”x18”x6” thick.

3.6 INSTALLATION OF FLOOR DRAINS (ALL TYPES)

A. Install floor drains in accordance with manufacturer's written instructions and in locations indicated.

B. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.

C. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

D. Position drains so that they are accessible and easy to maintain.

E. All floor drains shall be provided with trap primer connections. All floor drains shall have a trap primer discharge line connected to the outlet.

F. All exposed drainage piping shall be DWV copper pipe and fittings. All piping shall be rigidly supported off the wall with split ring clamps or uni-strut.

3.7 INSTALLATION OF ROOF DRAINS

A. Install drains in accordance with manufacturer's written instruction and in location indicated.

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B. Coordinate with roofing as necessary to interface roof drains with roofing work.

C. Install drains at low points of surface areas to be drained, or as indicated.

D. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes, where penetrated.

E. Position drains so that they are accessible and easy to maintain.

F. The roof drain specified is a combination "Primary and Secondary" arrangement. Verify the correct outlet connections to their respective systems.

3.8 INSTALLATION OF DOWNSPOUT SHOES

A. Install downspout shoes in accordance with manufacturer's written instructions and in locations indicated.

B. Downspout shoes shall be installed with top of shoe located 18 inches above finished grade.

3.9 INSTALLATION OF BACKWATER VALVES

A. A threaded plug, female adaptor and 6-inch diameter (152.4 mm) pipe shall be supplied by others for use as the access sleeve and cover. The access sleeve shall be cut to length in the field and attached to the socket on the top of the valve body. This forms the housing for the removable integral lifting device. The integral lifting device consists, in part, of a 4-inch diameter (101.6 mm) pipe which is supplied by others. The 4-inch diameter (101.6 mm) pipe is cut to length in the field, then joined to the disc assembly on the bottom and the collar on the top.

B. The manufacturer's published installation instructions shall be strictly adhered to and, if requested by the code official, a copy shall be maintained on the job site during installation. A copy of the maintenance instructions shall be left with the Owner.

3.10 INSTALLATION OF INTERCEPTORS

A. Install interceptors in accordance with manufacturer's written instruction and in location indicated.

B. Install flow control fitting where indicated on the drawing and/or diagrams including vent relief piping.

C. Interceptors shall be vented in accordance with the local plumbing code and as indicated on the drawings.

3.11 INSTALLATION OF FOUNDATION DRAINAGE

A. Each section of foundation drainage piping shall be extended up, to a cleanout at grade. Piping shall pitch toward the connection to the stormwater drainage system.

B. Piping shall be laid on minimum of 6 inches No. 8 aggregate crushed stone, and backfill shall be done as detailed on the drawings. Crushed stone shall be washed. Aggregate shall be of the sizes indicated and in accordance with ASTM standards. Stone fill layer shall be carefully placed to the indicated depth without disturbing the pipe alignment and a layer of untreated building paper or 2 inches of salt

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hay placed on top of the stone, the full width of the trench. Remaining earth fill shall be mounded at top to allow for settlement.

3.12 UNDERGROUND METALLIC TAPE

A. All exterior underground PVC drainage piping (sanitary, storm, condensate waste) shall be provided with detectable metallic underground tape.

B. Tape shall be similar to Lineguard Maintenance Systems as provided by Utility Supply of America 800-548-1234 or approved substitute as manufactured by Seton.

C. Installation shall comply with manufacturer's recommendations and shall be installed in the backfill after refilling the trench opening completely, and allowed to settle to the desired 4" to 6" depth. The Contractor shall install the tape after final lifts in compaction backfilling or unroll it before final restoration or installation of sod, black dirt, seeding, etc.

D. The tape system shall be installed under the supervision of the Owner's Representative. When the tape system is complete, the Contractor shall provide a test using the tape manufacturer's recommended detection device, to prove the integrity of the installation with the Owner's Representative.

3.13 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.

3.14 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.

3.15 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.

3.16 BUILDING DRAINAGE SYSTEM CLEANING AND CAMERA VIDEO TAPE/TRANSMITTER

A. The Plumbing Contractor shall hire the services of Tri-State Grouting (302) 286-0701, Contact: Bert Andrus.

B. The Camera-Video tape/transmitter work shall be executed for the benefit of the Plumbing Contractor to locate all existing below-floor slab sanitary and storm water drainage systems. This work shall be done to verify exact locations where new piping systems shall connect to existing piping systems.

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C. When all plumbing work is complete and before final test of the drainage systems, the entire building active below-slab storm and sanitary waste systems, including all short run and small pipe laterals, shall be power flushed and cleaned to clear all or any obstructions in the line. The work shall include all stack systems through each (VTR) vent thru roof and roof drain to the exterior laterals that exit the building.

END OF SECTION

NOT FOR BIDDING PURPOSES

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. Exterior water service piping from main at curb to building domestic water piping.

2. Exterior water service piping from connection 5'-0" beyond building foundation to building domestic water piping.

3. Exterior fire/sprinkler service from connection 5'-0" beyond building foundation to flanged connection 12" above finished floor slab in Mechanical/Boiler Room.

4. Exterior fire/sprinkler service from street main connection to flanged connection 12" above finished floor slab in Mechanical/Boiler Room.

5. Exterior domestic water meter and pit installation.

6. Domestic cold-water piping.

7. Domestic hot-water piping.

8. Domestic recirculating-water piping.

C. Complete flow balancing of the entire domestic hot water return system.

D. Insulation for domestic water piping as specified in Section 22 00 30 is included as work of this section.

E. Trenching and backfill required in conjunction with exterior water piping as specified in Section 22 00 00 is included as work of this section. Refer to Division 1.

NOT FOR BIDDING PURPOSES

1.3 REFERENCE STANDARDS

A. Refer to Section 22 00 00 for a general description of requirements applying to this section.

1.4 QUALITY ASSURANCE

A. Refer to Section 22 00 10 for a general description of requirements applying to this section.

1.5 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 22 00 00.

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

NOT FOR BIDDING PURPOSES

Fittings:	Wrought copper solder joint.
Pipe Size 4" and Over:	Ductile-iron pipe with cement-mortar lining, and gasketed joints.
Pipe Weight:	Schedule 150.
Fittings:	Ductile-iron, with cement-mortar lining, mechanical joint.
Pipe Size 3" and Smaller:	Polyvinyl Chloride (PVC) ASTM 1785
Wall Thickness:	Schedule 80.
Fittings:	PVC with Schedule 80, socket-type solvent joints or elastomeric gasketed joints.
Pipe Size 4" to 12":	Polyvinyl Chloride (PVC) AWWA C900
Pipe Class:	Class 150
Fittings:	Molded pressure Class 150 with AWWA C907, gaskets conforming to ASTM F 477.

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. <u>Sectional Valves:</u>

2-1/2" and Smaller:	Ball Valves. Gate Valves.

NOT FOR BIDDING PURPOSES

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). (w/ Memory Stop)

F. Check Valves:

All Sizes:	Swing Check Valves. Horizontal Installations Spring Check Valves. Vertical Installations

2.6 WATER METER

A. Provide water meter and related piping conforming to applicable local Utility Company regulations and AWWA Standards.

B. Water Meter: Provided by Local Utility Company. Provide roughing- in and bypass for meter in accordance with Utility Company requirements.

2.7 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.

D. Lawn Boxes: Non-freeze, bronze ground hydrant with locking cover, rough bronze box, vacuum breaker, 1-inch connection, and suitable for 4'-0" depth of bury.

2.8 BASIC THERMOMETERS AND GAUGES

A. Provide thermometers and gauges complying with Division 22 Basic Materials and Methods Section "Meters and Gauges", in accordance with the following listing:

NOT FOR BIDDING PURPOSES

Pressure gauges
Glass thermometers
Pressure and temperature connections

2.9 BASIC PUMPS

A. Provide pumps as specified in applicable Section 220150 Equipment - Plumbing. Use inline pumps for hot water recirculating.

2.10 BACKFLOW PREVENTERS

A. Provide, of the type indicated on the drawing schedule, reduced pressure principal type backflow preventers shall consist of an assembly including shutoff valves on inlet and outlet, and a strainer on inlet. Backflow preventers shall include test cocks, and pressure-differential relief valve located between two positive seating check valves. Construct in accordance with ASSE Standard.

B. On dead-end services (HVAC make-up) provide a spring-loaded check valve ahead of the backflow preventer assembly.

2.11 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:

<u>Shock Absorbers:</u>
Zurn
Josam
Wade
Watts
Smith
PPP Inc.
MIFAB

<u>Automatic Trap Primers</u>
PPP Inc.
Sloan
Sioux Chief
MIFAB

<u>Hose Bibbs</u>
Nibco
Tanner
Central Brass
Wolverine

<u>Wall Hydrants</u>
Nibco

NOT FOR BIDDING PURPOSES

Tanner
Central Brass
Wolverine

Wall Hydrants
Zurn
Josam
Wade
Watts
Smith
Woodford
MIFAB

Lawn Boxes
Zurn
Josam
Wade
Watts
Smith
Woodford
MIFAB

Backflow Preventers
Conbraco
Febco
Cla-Val
Wilkins
ITT Grinnell
Neptune
Watts

Relief Valves
Rockwell
Fisher
DeZurik

Pressure Reducing Valves
Conbraco
Jamesbury
DeZurik
Fisher
ITT Bell & Gossett

PART 3 – EXECUTION

3.1 INSTALLATION OF BASIC IDENTIFICATION

A. Install mechanical identification in accordance with Section 22 00 10 Basic Materials and Methods.

NOT FOR BIDDING PURPOSES

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 DOMESTIC WATER SERVICE SYSTEM - BUILDING

A. Install water distribution system in accordance with Section 220010 Basic Materials and Methods, and the International Mechanical Codes Section 305, and Support Intervals under Tables 305.4 and 308.5 or in accordance with MSS-SP-69.

3.3 INSTALLATION OF DOMESTIC WATER SERVICE SYSTEM - SITE

A. Install site water service system in compliance with local governing regulations.

B. Street Main Connection: Arrange and pay for tap in water main, of size and in location indicated, by Local Water Utility Company.

C. Water Service Piping: Extend water service piping from service stop of size and in location indicated to the meter pit and from the meter pit to the water service entrance at building. Provide sleeve in foundation wall for water service entry; make entry watertight. Provide gate valve at water service entry inside building, strainer, pressure gauge, test tee with valve.

D. Ductile-Iron Pipe: Install in accordance with ANSI/AWWA C-60.

E. Sterilization: At completion of water service line installation, flush and sterilize in conformance with AWWA C-601, to satisfaction of local Authorities having jurisdiction.

3.4 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.

3.5 INSTALLATION OF LAWN BOXES

A. Lawn boxes shall be provided with 18" x 18" x 6" concrete pad at grade, unless located in paving.

NOT FOR BIDDING PURPOSES

Installation shall include 1 cu. ft. of crushed stone at the base of the hydrant, to accept drainage from weep holes.

3.6 REACTION BACKING

A. All plugs, tees and elbows in the underground piping shall be provided with reaction backing consisting of concrete placed between solid undisturbed earth and the fitting to be anchored. Concrete shall be of such bearing area as to assure adequate resistance to the thrust to be encountered. In general, backing shall be so placed that the joint will be accessible for inspection and repair.

3.7 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.

3.8 INSTALLATION OF BACKFLOW PREVENTERS

A. Install backflow preventers where indicated, and where required by International Plumbing Code. Locate in same room or area as equipment being protected.

B. RPZ type backflow preventers to be piped from the relief outlet to nearest floor drain.

C. A check valve is required on the upstream side of all RPZ installations.

3.9 INSTALLATION OF PRESSURE REGULATING VALVES

A. Install pressure regulating valves where indicated. Provide inlet and outlet shutoff valves, and ball valve bypass. Provide pressure gauge on valve outlet.

3.10 INSTALLATION OF EXPANSION COMPENSATION PRODUCTS

A. This project shall require the installation of expansion compensators.

NOT FOR BIDDING PURPOSES

B. Furnish and install expansion compensation products in accordance with Section 22 02 10 Basic Materials and Methods – HVAC.

3.11 INSTALLATION OF THERMOMETERS AND GAUGES

A. Install thermometers and gauges in accordance with Section 22 00 10 Basic Materials and Methods.

3.12 INSTALLATION OF WATER METER

A. Install water meter in accordance with Section 22 00 10 Basic Materials and Methods.

B. Meter shall be supported in accordance with the requirements of the Water Department.

3.13 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.

3.14 AUTOMATIC TRAP PRIMERS

A. Install units in accordance with manufacturer's written instructions.

B. Cap-off all unused tube connections not to be used for discharge procedures.

C. Units installed in Mechanical Room shall be surface mounted. All others shall be arranged for recessed installation and shall include a 14"x16" access door #D-1416SS.

D. All discharge tubing from the tube connectors to the floor drain connection shall be minimum Type "M" copper for above floor slab installations. Where discharge piping runs below the floor slab, the piping may be PVC grade water piping. Ensure that all connections are properly made and leak-free.

E. Verify all electrical connections prior to the start-up of the units.

F. Shield copper from direct contact with concrete, stone and sharp edges below slab.

3.15 SPARE PARTS

A. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

3.16 INSTALLATION OF EXTERIOR WATER PIPING (5'-0" EXTENSIONS)

A. Install exterior water service piping system in compliance with local governing regulations.

NOT FOR BIDDING PURPOSES

B. Main Connections: Coordinate all work with the Site Contractor. The Plumbing Contractor shall make final connections of the domestic and fire protection water services.

C. Water Service Piping: From the final connection points, extend water service piping of size and in locations indicated to the water service entrance in building. Provide ball valve at the domestic water service and a flanged connection with a ¾" blow-off valve for the fire protection water service (12 A.F.F.).

D. Ductile-Iron Pipe: Install in accordance with ANSI/AWWA C-60.

E. Test:

1. Domestic Water Service: Minimum 125 psi.
2. Fire Protection Water Service: Minimum 200 psi.
3. Combination Domestic & Fire Protection Water Service: Minimum 200 psi.

F. Sterilization: At completion of water service line installation, flush and sterilize in conformance with AWWA C-601, to satisfaction of local Authorities Having Jurisdiction.

3.17 KITCHEN DOMESTIC WATER

A. All kitchen domestic water system piping shall be roughed in and strictly coordinated with the kitchen equipment drawings.

B. Provide all rough-in piping and final connections to equipment furnished by the Kitchen Equipment Contractor (KEC). This also includes any equipment items furnished by the KEC and are to be completely installed by the Plumbing Contractor.

C. Verify all responsibilities during the bid phase of the work.

D. All piping shall be supported off the wall with split ring clamps or uni-strut.

E. All piping shall be insulated and identified.

F. Provide shut-off valves and stainless-steel flex hose connections to all individual equipment connections.

G. All exposed piping shall be chrome plated brass.

3.18 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 in HVAC Specification Section 230950.

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.

C. Where emergency showers are installed with thermostatic mixing valve, they shall require the installation of a hot water return line as detailed on the drawings.

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 22 01 30

GAS PIPING 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. Natural gas piping system as indicated on drawings and schedules, and by requirements of this section.

2. Applications for natural gas piping systems include the following:

   a. Gas service from street main to building meter by Delmarva Gas Division.
   b. Elevated pressure (psi) gas from meter location to rooftop gas-fired equipment.
   c. Low pressure (WC) from the meter location to all other equipment and outlets, requiring gas service.

3. Applications for propane gas piping systems include the following:

   a. All gas piping from the exterior secondary regulator assembly location to all equipment and outlets, requiring gas service.

4. Trenching and backfill required in conjunction with exterior gas distribution as specified in Section 220000 is included as work of this section. Refer to Division 1.

1.3 REFERENCE STANDARDS

A. Refer to Section 22 00 00 for a general description of requirements applying to this Section.

1.4 QUALITY ASSURANCE

A. Refer to Section 22 00 10 for a general description of requirements applying to this section.

1.5 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 22 00 00.

B. Submit the following:

1. Product data on gas valves.

NOT FOR BIDDING PURPOSES

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 NATURAL GAS PIPING MATERIALS AND PRODUCTS

A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with ANSI B31.2 where applicable, base pressure rating on natural gas piping system maximum design pressures. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match piping materials used in natural gas piping systems. Where more than 1 type of material or product is indicated, selection is Installer's option.

2.2 BASIC IDENTIFICATION

A. Provide identification complying with Division 22 Sections and in accordance with the following listing:

Building Distribution Piping: Plastic pipe markers.

Gas Service: Underground type plastic line markers with detectable wire.

Gas Valves: Plastic valve tags.

2.3 BASIC PIPE, TUBE AND FITTINGS

A. Provide pipe, tube and fittings complying with Section 220010 Basic Materials and Methods - Plumbing and in accordance with the following listing:

1. Interior Piping: Schedule 40 black steel ASTM A-53, A-106

Fittings: Malleable black iron, threaded (NCC)

2. Exterior Below Grade Piping:_____ASTM-A-53. (Medium-density polyethylene pipe.)

3. Exterior Exposed or Roof Top Piping: Schedule 40 black steel with weather coating.

Fittings: Wrought steel, butt welded.

2.4 BASIC PIPING SPECIALTIES

A. Provide piping specialties complying with applicable Division 22 Sections and in accordance with the following listing:

Pipe escutcheons

NOT FOR BIDDING PURPOSES

Pipe sleeves
Sleeve seals

2.5 SPECIAL VALVES

A. Valves required for gas piping systems on this project shall be the following types:

Gas Valves: (Up to 3")

1. Apollo 80-100 Series bronze gas ball valve. Threaded, 600 PSIG WOG, cold non-shock, 250 PSIG LP-Gas. 150 PSIG saturated steam. Vacuum service to 29 inches Hg. Federal Specification: WW-V-35C, Type: II, Composition: BZ, Style: 3.

2. Features:
   - UL Listed for LP-Gas and natural gas.
   - Large ports to reduce pressure drop
   - Reinforced TFE seats and seals
   - Blow-out-proof stem design
   - Optional tee handle available
   - Quarter turn on-off
   - Adjustable packing gland
   - One piece bronze body
   - Chromium plated ball

3. UL Listings:
   - Guide YSDT: LP-Gas shut-off valve.
   - Guide YRPV: Gas shut-off valve for use with natural and manufactured gases.

4. This valve shall be used for all pipe sizes up to 3" in the system.

Gas Valves (4" and Larger)

1. Apollo 88A-100 Series carbon steel, ANSI Class 150 flanged standard port ball valves.

   Standards of Compliance:
   IFGC: Section 409 (Valves)
   ASME B16.5 – Pipe Fittings and Flanges
   ASME B16.33 – Manual Operated Metal Gas Valves up to 125 psig
   ASME B16.38 – Large Metal Valve Gas Distribution
   ASME B31.8 – Gas Transmission and Distribution Piping Systems
   UL 125

B. Manufacturers: Subject to compliance with requirements, provide gas valves of one of the following:

Apollo/Conbraco
Stockham
Milwaukee
NIBCO, Inc.
Watts

NOT FOR BIDDING PURPOSES

2.6 GAS METER

A. Provided by Delmarva Gas Division.

2.7 GAS PRESSURE REGULATORS

A. ANSI Z21.18, single-stage, steel-jacketed, corrosion-resistant pressure regulators. Include atmospheric vent, elevation compensator, with threaded ends conforming to ASME B1.20.1 for 2 inch NPS and smaller and flanged ends for 2-1/2" NPS and larger. Regulator pressure ratings, inlet and outlet pressures, and flow volume in cubic feet per hour of natural gas at specific gravity are as indicated.

1. Service Pressure Regulators: Inlet pressure rating not less than natural gas distribution system service pressure.

2. Line Gas Pressure Regulators: Inlet pressure rating not less than system pressure.

3. Appliance Gas Pressure Regulators: Inlet pressure rating not less than system pressure.

4. Gas Pressure Regulator Vents: Factory or field installed corrosion-resistant screen in opening when not connected to vent piping.

5. Regulators shall be as manufactured by Fisher (no equal substitute permitted).

PART 3 – EXECUTION

3.1 INSTALLATION OF BASIC IDENTIFICATION

A. Install mechanical identification in accordance with applicable Division 22 Sections.

3.2 INSTALLATION OF NATURAL GAS PIPING (INTERIOR)

A. Install natural gas distribution piping in accordance with Section 220010 Basic Materials and Methods - Plumbing and in accordance with applicable codes IFGC latest edition, and local Utility Company requirements.

B. Use sealants on metal gas piping threads which are chemically resistant to natural gas. Use sealants sparingly and apply to only male threads of metal joints.

C. Remove cutting and threading burrs before assembling piping.

D. Do not install defective piping or fittings. Do not use pipe with threads which are chipped, stripped or damaged.

E. Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping or equipment connections are completed.

F. Install drip-legs in gas piping where indicated, and where required by code or regulation.

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G. Install "Tee" fitting with bottom outlet plugged or capped at bottom of pipe risers.

H. Use dielectric unions where dissimilar metals are joined together.

I. Install piping with 1" drop in 60' pipe run (0.14%) in direction of flow.

J. Install piping parallel to other piping, but maintain minimum of 12" clearance between gas piping and steam or hot water piping above 200 degrees F (93 degrees C).

K. For piping buried in building substrate, or below floor slabs, install in welded conduit, ventilated to outdoors on both ends, and tested to same requirements as gas piping.

L. Gas valves shall not be installed above ceilings without access and signage.

M. Supports:

1. All pipe, fittings, valves, installation and testing shall be in accordance with the IFGC, Chapter 4.

2. Gas piping shall be supported in accordance with the International Fuel Gas Code's latest accepted 2003 Edition, Section 407, as follows:

3. Support intervals shall be in accordance with the IFGC listed above and in Section 415, Table 415.1 as follows:

   a. Steel pipe ½" nominal size – not to exceed 6 ft.
   b. Steel pipe ¾" to 1" nominal size – not to exceed 8 ft.
   c. Steel pipe 1-1/4" and larger nominal size horizontal – not to exceed 10 ft.
   d. Steel pipe 1-1/4" and larger nominal size, vertical not to exceed every floor.

4. Support and spacing of CSST Systems shall be in accordance with CSST manufacturer's instructions.

3.3 GAS SERVICE

A. Arrange and coordinate with Utility Company to provide gas service and meter at indicated location with shutoff at terminus. Consult with Utility as to extent of its work, costs, fees and permits involved. Pay such costs and fees; obtain permits.

B. Extend service pipe from Utility's terminus to distribution piping, in compliance with Utility's requirements.

3.4 INSTALLATION OF VALVES

A. Gas valves: Provide at connection to gas train for each gas-fired equipment item; and on risers and branches where indicated.

B. Locate gas valves where easily accessible, and where protected from possible damage.

NOT FOR BIDDING PURPOSES

3.5 EQUIPMENT CONNECTIONS

A. Connect gas piping to each gas-fired equipment item, with drip leg, union and shutoff gas valve. Comply with equipment manufacturer's instructions. Drip legs shall not be installed on any exterior gas piping.

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. Piping shall be of the same material as the system to which it connects.

C. All rooftop, gas-fired equipment shall be provided with gas pressure regulating valve to reduce gas pressure from _____ psi to _____" WC. All regulators shall be provided with vent discharge piping of lengths as required for minimum distance of equipment air intake grilles.

3.6 INSTALLATION OF GAS PRESSURE REGULATORS

A. This Contractor shall furnish and install gas pressure regulating valves for all shown on the drawings. Installation shall be in strict accordance with the requirements of the Utility Company and the Canadian Gas Association.

B. All regulators installed shall be tagged with data noting the inlet and outlet pressure for each individual regulator installed.

C. Medium or High Pressure (MP) (HP) Regulators shall comply with the following:

1. The MP regulator shall be approved and shall be suitable for the inlet and outlet gas pressures for the application.

2. The MP regulator shall maintain a reduced outlet pressure under lockup (no flow) conditions.

3. The capacity of the MP regulator, determined by published ratings of its manufacturer, shall be adequate to supply the appliances served.

4. The MP pressure regulator shall be provided with access. Where located indoors, the regulator shall be vented to the outdoors or shall be equipped with a leak-limiting device, in either case complying with Section 410 of the IFGC.

5. A tee fitting with one opening capped or plugged shall be installed between the MP regulator and its upstream shutoff valve. Such tee fitting shall be positioned to allow connection of a pressure-measuring instrument and to serve as a sediment trap.

6. A tee fitting with one opening capped or plugged shall be installed not less than 10 pipe diameters downstream of the MP regulator outlet. Such tee fitting shall be positioned to allow connection of a pressure-measuring instrument.

NOT FOR BIDDING PURPOSES

3.7 EXTERIOR GAS PIPING

A. All rooftop or exterior gas piping shall be weatherproof with and epoxy resin approved by the Gas Company.

B. Uncoated, threaded or socket welded joints shall not be used in piping in contact with soil or where internal or external service corrosion is known to occur.

C. Protective Coatings and Wrapping: Pipe protective coatings and wrappings shall be approved for the application and shall be factory applied.

D. In lieu of coated steel pipe, the Contractor may use high grade material, physical and mechanical properties as classified in accordance to ASTM D 3350 and cell classification of 23447373E plastic pipe and fittings for underground use only, and shall conform with ASTM D-2513. Pipe shall be marked "GAS" and "ASTM D-2513". Only Contractors registered and/or certified for installation of underground or below-grade plastic piping shall be permitted to install this material on this project.

E. Detectable underground warning tape shall read ("CAUTION – BURIED GAS LINE BELOW"). Printed on APWA approved colors, minimum 2" wide, 5 mil tape with aluminum backing for using non-ferrous locator.

F. All exterior gas pipe and fittings installed, including all welded joints, shall be provided with weatherproof coatings. The coatings shall be a two-layer PE "Pritec" coating as manufactured by Liberty Coating. The coatings shall be Butyl rubber adhesive with a polyethylene topcoat.

G. Component Properties:

Adhesive
Polyethylene

ADHESIVE		
Softening Point	ASTM E28	190°F
Water Absorption	ASTM D570	<0.1%
Adhesive		Compounded Butyl Rubber

POLYETHYLENE		
Color		Black
Density	ASTM D1505	>0.950
Elongation	ASTM D638	>600%
Tensile Strength	ASTM D638	>2,800 psi
Outdoor Exposure		>2 years
Hardness, Shore D	ASTM D2240	>60

PRITEC®		
Operating Temperature		-40°F to +180°F
*Peel Strength	ASTM D1000	>20 lbs lineal
Field Bending	Arctic Service Equipment	1.9 deg. per pipe dia.
Water Absorption	ASTM D570	0.06%
Impact Resistance	ASTM G14	33.65 in/lbs (10/40 sys.)

NOT FOR BIDDING PURPOSES

Volume Resistivity	ASTM D257	$10x10^{16}$ Ohm cm
Dielectric Strength	ASTM D149 @73°F	700 Volts/Mil
Cathodic Disbondment	1.5v/3%/70°F/24 Hrs.	6 mm radiius

END OF SECTION

NOT FOR BIDDING PURPOSES

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
   Urinals
   Lavatories
   Countertop Sinks
   Service Sinks
   Mop Receptors
   Showers
   Electric Water Coolers
   Drinking Fountain/Cuspidor
   Sensor-Operated Flush Valves and Faucets
   Manually Operated Flush Valves
   Handicap Lavatory Insulation
   Lavatory Shield Enclosure

3. Refer to Section 22 01 20 for domestic water piping systems used in conjunction with plumbing fixtures; not work of this section.

4. Refer to Section 22 01 10 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 22 00 00 for a general description of requirements applying to this section.

NOT FOR BIDDING PURPOSES

1.4 QUALITY ASSURANCE

A. Refer to Section 22 00 10 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 measure 17" to 19" from the floor to the top of the seat. 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) mounted no higher than 17" from the floor.

4. Lavatories shall be mounted no higher than 34" 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, electronically operated. 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

NOT FOR BIDDING PURPOSES

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.

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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.

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2.4 FIXTURE LIST

A. Refer to the "Plumbing Fixture & Equipment Schedule" as indicated on the drawings.

2.5 SHOWER – HANDICAP

A. The shower modules shall be manufactured by Crane Plumbing/Fiat Products #MSCI-307, RH/LH (36" x 35") and shall be thermoformed from continuous cast acrylic sheet into one-piece, seamless units. The units shall be reinforced in the back with fiberglass reinforced polyester resin and have a backside fire rating of "A" and flame spread of 25.

B. Shower modules shall be pre-drilled and equipped with a model 180AA pressure balanced, single dial lever mixing valve with stops, hand held shower head with swivel fitting, 69" flexible stainless-steel hose and in-line vacuum breaker, 10 oz. GSA approved shower curtain with curtain hoods, 2" cast brass chrome plated shower drain, and 1" diameter stainless steel curtain rod.

C. All units shall have anti-skid floor treatment to meet performance requirements of ASTM F-462-78. All units are listed under SBCCI Report No. 8556 and BOCA Report No. 86-40.

D. Additional back reinforcements shall be suitably located to provide code complying structural integrity for factory attaching of grab bars, curtain rod, and slide guide for hand held flexible hose shower head.

E. Standard Equipment:

1. Factory Installed:

a. Grab Bars: see table for individual models.
b. Curtain rod: 1" diameter, stainless steel.
c. Shower curtain, 10 oz. with curtain hooks, GSA approved.
d. 2” shower drain, chrome plated, cast brass.
e. Retractable, compact shower seat with stainless steel frame and teakwood seat.

2. Optional Equipment:

a. Model 180AA pressure balanced, single dial lever mixing valve with integral check stops.
b. Hand held shower H-11with swivel fitting, 69" flexible stainless steel hose, and in-line vacuum breaker.
c. Slide guide H-12, 24”
d. Dome light, ATP-1, 60 watt, recessed.

F. Color: Color option is required. Final selection by Architect.

2.6 SENSOR-OPERATED FLUSH VALVES & FAUCETS

A. This Contractor shall furnish and install complete and operating sensor operational faucets and flush valves 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

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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. Flush valve electrical box positioning and support kits shall be provided wherever drywall partitions are installed. The kit shall be specifically designed to accurately position and ease the installation of the electrical box and the plumbing rough-in piping and valve. The kit shall be supplied by the flush valve manufacturer and installed by the Plumbing Contractor.

H. The manufacturer's representative shall have at least two (2) site visits to verify that equipment and wiring are properly installed.

I. 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.

2.7 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 (Floor-Mounted Bottom Outlet – China)
Water Closets (Wall-Mounted Back Outlet – China)
Water Closets (Tank Type-Floor Outlet - China)

All water closets on this project shall be maximum 1.6 gallons per flush and shall be of the pressure tank (pneumatic assisted) type with the Water Control International "WCI" System ANSI A112-19-2M and ASSE Standard 1037. Manufacturers shall be limited to the following:

All water closets on this project shall be maximum 1.6 gallons per flush, and shall be of the direct-fed siphon jet action with water control international "WCI" System, ASME A112.19.2M (and 19.6M) for vitreous china fixtures.

Crane
American Standard
Kohler

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<u>China/Enameled Fixtures</u>
Kohler
American Standard
Eljer
Crane
ToTo

<u>Faucets/Trim (Non-Sensor Operated)</u>
Kohler
American Standard
Delta
Moen
Elkay
Speakman
Chicago

<u>Faucets/Trim (Sensor-Operated)</u>
Sloan
Speakman
ToTo
Chicago

<u>Flush Valves</u>
Sloan "Royal" (optima Series (Sensor-Operated)
Coyne & Delany
Zurn
ToTo

<u>Wall Supplies/Traps</u>
McGuire
Brass-Craft
Kohler
American Standard
Sanitary-Dash
Teledyne
Wolverine
Pro-Flo
Keeny

<u>Fixture Carriers</u>
Zurn
Josam
Wade
Watts
Smith
MIFAB

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Fixture Seats
Olsonite
Sperzel
Benke
Bemis
Church
Kohler
American Standard
Centoco
Comfort Seat

Mop Receptors
Fiat
Stern-Williams
Mustee
Florestone

Note: All mop receptor installations must include the combination eyewash and service sink faucet arrangement.

Water Coolers
Elkay
Haws
Halsey-Taylor
Oasis
Acorn

Stainless Steel Sinks
Elkay
Just
Dayton
Advanced-Tabco

Shower Assemblies & Systems
Acorn
Symmons
Leonard
Powers
Bradley

Emergency/Safety Equipment
Bradley
Haws
Western
Speakman
Guardian

Shower Units
Fiat
Fibersheen
Kohler
American Standard

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Acryline
Aqua-Glass
Aquarius
Aqua-Bath

Washer Utility Boxes
Symmons
Guy-Gray
Oatey

Instantaneous Electric Water Heaters
Chronomite
Eemax

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.

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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.

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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

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SECTION 22 01 50

EQUIPMENT – 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 equipment as indicated on drawings and provisions of this section, including schedules and equipment lists associated with either drawings or this section.

2. Types of plumbing equipment required for project include the following:

Recirculating Pumps-Domestic Water Return (110 degrees & 140 degrees)
Instantaneous Water Heater (Gas-Fired)
Instantaneous Water Heater (Electric)
Packaged Domestic Water Heater
Exterior Grease Interceptor Vault
Solids Interceptor
Domestic Water Heater
Thermostatic Mixing Valve
Covers, Grates and Frames
Catch Basin Traps
Duplex Sewage Pump System
Foundation Drain System Sump Pump
Elevator Sump Pump System
Boiler Relief Quench Tank

1.3 REFERENCE STANDARDS

A. Refer to Section 22 00 00 for a general description of requirements applying to this section.

B. UL and NEMA Compliance: Provide electric motors and electrical components required as part of plumbing equipment, which have been listed and labeled by Underwriters' Laboratories and comply with NEMA Standards.

C. NEC Compliance: Comply with National Electrical Code (ANSI/NFPA 70) as applicable to installation and electrical connections of ancillary electrical components of plumbing equipment.

D. ASME Relief Valve Stamps: Provide water heaters with safety relief valves bearing ASME valve markings.

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E. AWWA Compliance: Comply with applicable American Water Works Association Standards pertaining to steel water tanks.

F. CSA and NSF Labels: Provide water tanks which have been listed and labeled by CSA International and National Sanitation Foundation.

G. ASME Code Symbol Stamps: For the following equipment, comply with ASME Boiler & Pressure Vessel Code for construction and stamp with ASME Code Symbol:

Packaged Domestic Water Heater

H. All packaged equipment shall be independently third party, labeled as a system for its intended use by a nationally recognized testing laboratory (NRTL) in accordance with OSHA Federal Regulations 29CFR 1910.303 and .349 as well as NFPA Pamphlet #70 and NEC Article 90.7.

1.4 QUALITY ASSURANCE

A. Refer to Section 22 00 10 for a general description of requirements applying to this section.

1.5 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 22 00 00.

B. Submit the following:

1. Product data on all equipment including roughing-in data.
2. Connection diagrams for related piping and specialties.

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 EQUIPMENT

A. Refer to "Plumbing Fixture & Equipment Schedule" for type, numbers, size and manufacturer of all equipment accessories.

2.2 HOT WATER CIRCULATING PUMPS

A. Provide and install where indicated on the drawings, domestic hot water circulating pumps complete with controls and piping as shown on the drawings. Each pump shall have a capacity of 5 gallons per minute against a total discharge head of 17 feet.

B. Pumps shall be close coupled, centrifugal type, all low lead or lead-free bronze with flexible connection to a 1/6 HP, 1750 RPM, 60 cycle, 120 volt, single phase motor.

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C. Pump shall be controlled by a manual starter, furnished and installed by the Electrical Contractor. Pumps shall run continuously and be wired into night setback operations.

2.3 MASTER MIXING VALVE

A. Mixing valve shall be constructed entirely of lead free bronze and copper and hydrostatically tested to a pressure of 300 lb. Unit shall be provided with the following features.

1. A long mixing chamber with vanes at an angle to the longitudinal axis of the valve which shall cause a thorough mixing of the hot and cold water.

2. The length of the hydraulic thermostatic element shall assure effective contact with the water.

3. The thermostatic element shall be placed in the body of the valve where the hot and cold water mix. Unit shall be sensitive to any change in water temperature and make the proper correction by opening or closing the hot and cold water inlets in the valve.

4. The sensitive parts of the thermostatic element shall be inside a heavy non-ferrous tube which shall protect them from any corrosive or scaling action caused by the continuous flow of water past them.

B. Unit shall be as sized on the drawings.

C. Temperature adjusting range shall be between 80 and 160 degrees F.

2.4 WATER HEATER

A. The water heater shall be Bradford White Model le120l3-3 with a storage capacity of not less than 20 gallons. The tank shall be lined with Vitraglas vitreous enamel. The tank shall have one extruded magnesium anode rod. The insulation shall be foam material of 1" nominal thickness. The entire installation shall be made in accordance with state and local codes and ordinances.

B. Vacuum Relief Valve: All bottom fed water heaters and bottom fed hot water storage tanks connected to water heaters shall be installed with a vacuum relief valve. The valve shall be installed on the (cold water) fed piping above the top of the water heater and/or storage tank and per the manufacturer's requirements. Vacuum relief valves shall comply with ANSI Z21.22.

2.5 COVERS, GRATES AND FRAMES

A. Each manhole and catch basin shall be fitted with a cast iron cover or grate and frame of the dimensions and weight shown on the drawings. The material used in the manufacture of the casings shall conform to ASTM Designation A-48, as last amended, class 30 iron. The castings shall be free from imperfection and thoroughly cleaned with covers or grates and frames straight and true to pattern. The cover or grate must have a continuous and even bearing on the frame and shall be properly set to avoid rocking. All inequalities, projections, or roughness on abutting surfaces of the castings must be removed and the cover or grate fitted into the frame as neatly as possible without jamming.

B. Prior to setting the frames, grates and covers on manholes or catch basins, this Contractor shall verify final finish grade adjacent to each structure and make the necessary adjustments to locate the cover or grate level and flush with finished grade.

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2.6 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering plumbing equipment shall be limited to the following:

1. Domestic Water Heaters
   PVI
   Weben-Jarco
   Ace-Buehler

2. Domestic Water Heaters
   Ruud
   Bradford-White
   State

3. Hot Water Circulating Pumps
   Armstrong
   Bell and Gossett
   Taco
   Aurora
   Grundfos
   Amtrol

4. Solids Interceptors
   Zurn
   Josam
   Wade
   Ancon
   Smith

5. Exterior Interceptor Vaults (Precast)
   Tyson F. Sartin
   A.C. Miller
   Penn Cast

6. Instantaneous Water Heater (Electric)
   Chromomite

7. Instantaneous Water Heater (Gas-Fired)
   Rannai
   Bradford-White
   Navrin

8. Master Mixing Valve (Domestic Hot Water System)
   Holby Valve Co.

9. Self-Powered Water Conditioner
   Ecotec (no equal)

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10. Electronic Monitored Grease Trap
    J. R. Smith

11. Automatic Trap Primer
    PPP, Inc.

12. Boiler Relief Hot Water Pump
    Oats
    Hydromatic
    Zoeller

13. Foundation Drain Sump Pump
    Penn Pump Equipment Co., Inc.

14. Hot Water Circulating Pumps
    Taco

PART 3 – EXECUTION

3.1 INSTALLATION OF WATER HEATERS

A. Install water heaters where indicated in accordance with manufacturer's installation instructions and in compliance with applicable codes.

B. Set units where indicated, orient so controls and devices needing service and maintenance have adequate access. Level and plumb units. Each unit shall be set on a concrete housekeeping pad.

C. Existing Mechanical Room: Reconnect existing gas hot and cold piping to new unit. Alter piping to suit new connections. Connect recirculating line to unit with check valve and shutoff valve. Extend relief valve discharge to nearest floor drain. Extend and connect new flue exhaust to existing breeching.

D. New Mechanical Room: Connect gas, hot and cold and recirculating piping system and all associated equipment and devices as detailed on the drawing. Flue extension, roof penetration and weatherproof hood shall be by this Contractor.

E. Start-up, test and adjust hot water heaters in accordance with manufacturer's start-up instructions. Check and calibrate controls.

3.2 INSTALLATION OF GAS-FIRED AND INSTANTANEOUS GAS-FIRED WATER HEATER

A. Furnish and install a complete and operating system. Install water heaters where indicated in accordance with manufacturer’s installation instructions and in compliance with applicable codes. Provide all control wiring for proper operation of the unit.

B. Set unit where indicated, orient so controls and devices needing service and maintenance have adequate access. Level and plumb unit.

C. The unit shall be set on a concrete pad or wall hung for instantaneous type.

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D. Start-up, test and adjust hot water heaters in accordance with manufacturer's start-up instructions. Check and calibrate controls. Start-up shall include the services of the manufacturer's representative.

E. Combination exhaust vent and air intake shall be included as part of the heater package and extended through the exterior wall and terminate with a grille furnished by the unit manufacturer.

F. Install piping and valving as indicated on piping diagram.

3.3 INSTALLATION OF THERMOSTATIC MIXING VALVE

A. Install mixing valve in accordance with manufacturer's installation instructions and in compliance with applicable codes.

B. At startup of domestic hot water system, mixing valve outlet temperature shall be checked to insure proper setting and operation. Following adjustments, if required, the mixing valve, if not performing. check if factory required differential temperature in/out with a minimum of 20º Delta "T" is maintained.

C. Provide minimum 27" (end of pipe to end of pipe) heat trap in accordance with manufacturer's recommendations and as detailed on the drawing.

D. The temperature of the water delivered by the mixing valve shall be changed by turning the adjusting screw to the right or clockwise for lower temperature and to the left or counter clockwise for higher temperatures. Maintain a uniform temperature regardless of temperature of incoming water. To facilitate adjustment, a thermometer shall be placed in the line beyond the Holby Tempering Valve as shown in the diagram and water shall be flowing through the Holby Tempering Valve while adjustment is being made.

E. Check valves shall be installed on both inlet (hot and cold) to the unit. Include a full-size bypass valve arrangement.

F. The hot water return line shall always be piped through the cold-water make-up side of the mixing valve.

3.4 INSTALLATION OF HOT WATER CIRCULATING PUMPS

A. Install pumps where indicated, in accordance with manufacturer's published installation instructions, with recommended clearances provided for service and maintenance.

B. Install in-line pumps, supported from piping system, located for access to oil cups, service, and maintenance.

C. Lubricate pumps before start-up. Start-up shall be in accordance with manufacturer's instructions.

D. Install pump unit as detailed on the drawing. Include a check valve and thermometer at the pump unit. The pump shall run on continuous operation. The pump shall be wired into night setback by the ATC system installer.

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3.5 AUTOMATIC TRAP PRIMER

A. The automatic trap primer units specified shall be recessed mounted and in the location indicated.

B. Installation shall conform to manufacturer's written instructions. The Electrical Contractor shall provide 120-volt electrical power and final connection.

C. The unit installation shall include a discharge line to each floor drain (F-8, F-9 and F-10) indicated and/or noted on the drawings. Any unused discharge line off the unit's discharge manifold shall be capped off within the panel.

D. All discharge lines shall be minimum "M" copper tube or flexible polyethylene tubing. All tubing shall be protected during below floor slab construction.

E. The unit shall be factory tested, assembled and prepiped and shall include a ¾" ball valve, shock absorber, vacuum breaker, copper distribution manifold, solenoid valve.

END OF SECTION

NOT FOR BIDDING PURPOSES

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. Extent of plumbing systems to be tested is indicated on the drawings and by requirements of this section.

B. Applications of tests include the following:

1. Interior Piping

   a. Domestic cold, hot & hot water return piping
   b. Gas piping
   c. Sanitary and condensate waste drainage piping
   d. Storm water drainage piping

2. Exterior Piping

   a. Sanitary drainage piping
   b. Domestic water service
   c. Gas service
   d. Storm drainage piping

C. See Fire Protection Specifications for testing of Fire Protection Systems.

1.3 REFERENCE STANDARDS

A. Refer to Section 22 00 00 for a general description of requirements applying to this section.

1.4 QUALITY ASSURANCE

A. Refer to Section 22 00 10 for a general description of requirements applying to this section.

1.5 SUBMITTALS

A. Submit test reports in accordance with Section 22 00 00.

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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 22 00 10 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

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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 no 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.

C. Natural Gas Piping:

1. All new, altered, extended or replaced interior natural gas piping installed shall be tested in accordance with the requirements of the National Fire Protection Association, latest edition of the IFGC, Section 107, and the requirements of the local Utility Company as applicable. In the absence of a specific test required by the Authorities, or if such requirements are less stringent than the test hereinafter specified, then the interior gas piping shall be tested as follows in the presence of the representative of the Architect.

2. Before appliances are connected, piping shall be filled with air or nitrogen, to a pressure of 10 psi and proved tight with no drop in pressure for the length of time required to inspect the joints, but in no case less than 30 minutes. The source of pressure shall be isolated before the pressure tests

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are performed. Pressure shall be measured with a mercury manometer, or slope gauge or equivalent device so calibrated as to be read in increments of not greater than one-tenth pound. All piping which will be concealed shall be tested, prior to being closed in by construction.

D. Compressed Air Piping: Compressed air piping shall be tested at 125 psi. The pressure shall be maintained on the system a minimum of 30 minutes without any loss in pressure. If a loss in pressure occurs, leakage shall be corrected and piping retested.

3.3 EXTERIOR PIPING

A. Sanitary & Storm Water Drainage Piping:

1. All new exterior sanitary and storm water drainage installed shall be tested in a manner and in a sequence best suited to project. The test shall be performed in the presence of the Inspector of the Municipality under whose jurisdiction the installation is made and shall conform to his requirements.

2. In the absence of a specific code test, the Contractor shall perform the following testing in the presence of the representatives of the Architect.

3. Before any section of sanitary and storm water drainage has been backfilled more than 6 inches above the top of the pipes, exclusive of the joint area, the system shall be tested. Wherever possible, the section of the system shall be tested from manhole to manhole. The lower end of each section to be tested shall be plugged with a suitable device manufactured for this purpose. The section being tested shall be filled with water and the leakage observed and gauged.

4. For the gravity sanitary drainage piping to be acceptable, the water leakage after filling shall not exceed 2 gallons per 24 hours per lineal foot of pipe joints with all joints under a constant pressure of not less than 0.1 pound.

5. For the storm water to be acceptable, the water leakage after filling shall not exceed 3 gallons per 24 hours per lineal foot of pipe joints with all joints under a constant pressure of not less than 0.1 pound.

B. Domestic Water Service: All new exterior water service piping installed shall be tested and proved tight. In the absence of specific requirements or requirements less stringent than those specified herein, this contractor shall test the piping at a minimum pressure of 125 psig maintaining the pressure for two hours without more than 2% drop in pressure. The system shall be filled with water which shall remain in the system until the water and piping are the same temperature.

OR

B. Water Service: All new exterior water service piping installed shall be tested and proved tight. In the absence of specific requirements or requirements less stringent than those specified herein, this contractor shall test the domestic water service piping at a minimum pressure of 125 psig maintaining the pressure for two hours without more than 2% drop in pressure. The 6" water service from the wet tap to the 6" sprinkler service entry location shall be tested in accordance with the NFPA requirements of at least 200 psi. The systems shall be filled with water which shall remain in the system until the water and piping are the same temperature.

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C. Gas Service:

1. All new exterior distribution piping, installed by this Contractor, for natural gas systems shall be tested in accordance with the requirements of the National Fire Protection Association, latest edition of the IFGC, Section 107, and the requirements of the local Utility Company. In the absence of a specific test required by the Authorities, or if such requirements are less stringent than the test hereinafter specified, then the exterior piping shall be tested as follows, before pressure regulating valves are installed, or connection made to interior piping.

2. Piping shall be filled with air or nitrogen, to a pressure of 100 psi, and proved tight with a drop-in pressure for the length of time required to inspect the joints, but in no case less than one hour. The source of pressure shall be isolated before the pressure tests are performed. Pressure shall be measured with a gauge so calibrated as to be read in increments of not greater than one pound.

3.4 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.

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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

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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. Extent of plumbing systems to be balanced is indicated on the drawings and by requirements of this section.

B. 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 22 00 00 for a general description of requirements applying to this section.

1.4 QUALITY ASSURANCE

A. Refer to Section 22 00 10 for a general description of requirements applying to this section.

1.5 SUBMITTALS

A. Submit balancing report in accordance with Section 22 00 00.

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 22 00 10 for replacement of any defective pipe or fittings. Replacement shall include all required draining of system, removal and replacement and uncovering, recovering.

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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 end 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

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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: 23 02 00 thru 23 09 50.

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. Make or arrange for utility connections and pay all charges.

D. 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

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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 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. Develop overall coordination drawing (all trades) and submit for review prior to fabrication/installation.

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, unfinished 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.

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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 indentify 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. Submit a 1/4" scale layout of all mechanical equipment rooms. All equipment and pads shall be to scale of equipment being furnished. Obtain size information of any and all equipment from other trades and indicate on drawings. The drawings shall be fully coordinated with all trades prior to submission. Indicate coil pull areas, filter pull areas, maintenance clearances, and access as applicable.

4. 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. Subcontractor'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.

5. Resubmit revised or additional shop drawings as requested.

6. 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.

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7. 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.

8. 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.

9. 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

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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.

E. Where only one brand name or manufacturer is identified, no substitutions are permitted.

F. 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. Architect will review requests and will notify Bidders in an Addendum if the requested substitution is acceptable.

2. Submit a separate request for each Product, supported with complete data, with drawings and samples as appropriate, including:

   a. Comparison of the qualities of the proposed substitution with that specified.
   b. Changes required in other elements of the work because of the substitution.
   c. Effect on the construction schedule.
   d. Cost data comparing the proposed substitution with the Product specified.
   e. Any required license fees or royalties.
   f. Availability of maintenance service, and source of replacement materials.

3. Architect shall be the judge of the acceptability of the proposed substitution.

4. A request for a substitution constitutes a representation that Bidder:

   a. Has investigated the proposed Product and determined that it is equal to or superior in all respects to that specified.

   b. Will provide the same warranties or bonds for the substitution as for the Product specified.

   c. Will coordinate the installation of an accepted substitution into the work, and make such other changes as may be required to make the work complete in all respects.

   d. Waives all claims for additional costs, under his responsibility, which may subsequently become apparent.

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.

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1.11 EQUIPMENT START-UP

A. Verify proper installation by manufacturer or his representative.

B. Advise General Contractor/Construction Manager/Owner's Representative (Choose one) 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/Construction Manager/Owner's Representative (Choose one).

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. Contractor to demonstrate all systems to Engineer for verification of operation prior to Owner's instruction period.

2. Provide two (2) 4-hour sessions of training to School District/Owner's 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.

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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.

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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 03300, or ACI-613.

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.

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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. Support vertical piping at floor levels. Piping shall have split rings.

I. Any lintels required for openings for this work if not indicated on Architectural or Structural drawings shall be provided under this Section.

J. Piping on the roof shall be supported by an engineered, prefabricated hanger system specifically designed for installation on the roof without roof penetrations, flashing or damage to the roofing material. The system shall consist of bases made of high density polypropylene plastic with additives for UV protection, hot dipped galvanized structural steel frames, hangers, fasteners, rods, etc. The system shall be complete and designed to fit the piping installed under actual conditions of service. The system shall be furnished as manufactured by PHP Systems & Design or Anvil International Haydon H-Block.

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

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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 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.

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. Seal sleeves for pipes or conduit 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.

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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, Hilti FS-one, 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 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.

3.9 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. Refrigeration Machinery Rooms shall be identified with a permanent placard of red-white-red laminated, commercial grade, plastic construction. Letters shall be minimum one inch high for the header to read in capital letters: WARNING – REFRIGERATION EQUIPMENT ROOM – LIMITED ACCESS. The following information shall be posted in a similar fashion, minimum half-inch high capital letters, indicating:

NOT FOR BIDDING PURPOSES

1. The name and address of the installer.
2. The refrigerant number and amount of refrigerant in pounds.
3. The lubricant identity and amount in pounds or ounces as appropriate.
4. The field test pressure applied to the equipment in psig.

Placard shall be centered on each door leading into the refrigeration equipment room at five feet above the floor and attached at each corner with brass screws.

F. 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.

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 or General Contractor 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 tube or 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.

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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 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.

3.14 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

A. The General Contractor shall be responsible 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.

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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.

E. 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, etc. prior to the expiration of the guarantee period.

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 23 09 50: 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

NOT FOR BIDDING PURPOSES

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. Copper Tubing & Fittings
2. Polyvinyl Chloride (PVC) Pipe and Fittings
3. Motors

1.3 REFERENCE STANDARDS

A. Refer to Section 23 02 00 for a general description of requirements applying to this section.

B. Install work to meet the requirements of the following:

1. New Castle County 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.

NOT FOR BIDDING PURPOSES

PART 2 – PRODUCTS

2.1 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.

5. Contractor's option: For water systems using ASTM B88 Type K or L hard drawn copper tubing in pipe sizes ½" to 2", provide copper press connections with fittings that conform to material and sizing requirements of ASME B16.18 or ASME B16.22 with O-ring seals made from commercial grade EPDM. All copper press fittings shall be made in accordance with the manufacturer's tools and accessories, and all published installation instructions as furnished by Ridgid/Viega Pro Press System.

C. Condensate Drain Piping:

1. Pipe: Copper tubing Type DWV.
2. Fittings: Wrought copper solder type drainage fittings, ASME B16.23 or B16.29.

2.2 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. Pipe:

1. ASTM D-1785 Schedule 40, Type 1, Grade 1
2. ASTM D-2665 (DWV) drain, waste and vent.

B. Fittings:

1. ASTM D-2466 Schedule 40
2. ASTM D-2665 DWV.

C. Solvent Cement: ASTM D-2564 Schedule 40 and DWV.

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D. Uniformity: To insure installation uniformity, all piping components shall be of one manufacturer.

E. Flux shall be non-toxic type and non-corrosive.

2.3 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 deg. 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
25	93.0	93.6	91.7	93.0	93.6	91.7
30	93.6	94.1	91.7	93.0	93.6	91.7
40	94.1	94.1	92.4	94.1	94.1	92.4
50	94.1	94.5	93.0	94.1	94.5	93.0
60	94.5	95.0	93.6	94.5	95.0	93.6
75	94.5	95.0	93.6	94.5	95.4	93.6
100	95.0	95.4	93.6	95.0	95.4	93.6
125	95.4	95.4	94.1	95.0	95.4	94.1
150	95.4	95.8	94.1	95.8	95.8	95.0

NOT FOR BIDDING PURPOSES

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
200	95.4	95.8	94.1	95.8	96.2	95.0

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.

1. Air vents shall be automatic in operation when located in Boiler Rooms, Chiller Rooms and Mechanical Equipment Rooms. All air vents shall be provided with a PVC drain line which shall be routed to the nearest floor drain. Several air vents may be tied together.

2. Air vents shall be manual in operation in all other locations.

3. Air vents on steam shall be piped down to floor with copper drain line.

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.

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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 shall remain level for hydronic systems. Bottom of pipe shall remain level for steam systems.

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. Install expansion joints, expansion compensators, anchors and guides in piping systems as shown on the drawings and in accordance with manufacturer's written instructions.

1. Provide anchors and guides on both sides of the expansion compensator or expansion joint in accordance with EJMA Standards.

2. Provide anchors and moment guides in each pipe, with the first moment guide located the equivalent of four-pipe diameters from the compensator, and the second guide fourteen pipe diameters beyond the first guide.

3. Remove all shipping blocks, stays, setscrews, etc., from all compensators and moment guides. Pipe centerlines shall be aligned.

4. During initial system pressurization, all pipe guides and anchors must be secure and functioning.

S. Material Requirements for Systems:

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1. AC Condensate Drain (including pumped condensate):

   a. Type DWV copper.
   b. Schedule 40 PVC.

2. 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.	Gas	- Yellow	- Black
2.	Refrigerant Liquid	- Yellow	- Black
3.	Refrigerant Gas	- Yellow	- Black

E. Provide color coded 1” diameter markers on ceiling tile grids to indicate system and valve locations.

3.3 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:

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1. Hot water heating piping
2. Chilled water piping
3. Air conditioning condensate drain piping
4. Dual temperature water piping
5. Cold water fill and make-up piping
6. Condenser water 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

NOT FOR BIDDING PURPOSES

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 23 02 00 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. 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 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.

NOT FOR BIDDING PURPOSES

B. Solenoid Valves:

1. 2-way Solenoid Valves: Forged brass, designed to conform to ARI 760, normally closed, teflon valve seat, NEMA 1 solenoid enclosure, 24-volt, 60 Hz., UL-listed, 1/2" conduit adapter, 250 degrees F (121 degrees C) temperature rating, 400 psi working pressure.

2. Manufacturers:

   Alco Controls Div., Emerson Electric Co.
   Automatic Switch Co.
   Sporland Valve Co.

C. 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. Evaporator Pressure Regulators: Provide corrosion-resistant, spring loaded, stainless steel springs, pressure operated, evaporator pressure regulator, in size and working pressure indicated, with copper connections.

5. Refrigerant Discharge Line Mufflers: Provide discharge line mufflers as recommended by equipment manufacturer for use in service indicated, UL listed.

6. 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.

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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 23 02 10.

END OF SECTION

NOT FOR BIDDING PURPOSES

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 23 02 00 for HVAC General Provisions

C. Refer to Section 23 02 10 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. Refrigerant Piping.
2. Insulated Pipe Saddles

B. Insulation shall be installed on the following duct systems:

1. All supply ductwork.
2. All return ductwork.
3. All outside air intake and relief ductwork.
4. All ductwork connected to energy recovery units.

1.3 REFERENCE STANDARDS

A. Refer to Section 23 02 00 for a general description of requirements applying to this section.

1.4 QUALITY ASSURANCE

A. Refer to Section 23 02 10 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 23 02 00.

B. Submit fabrication instructions for pipe fitting and valve insulation.

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C. Submit manufacturer's joining recommendations for butt joints and longitudinal seams.

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. 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 pre-molded PVC cover, Proto Corp., Johns Manville Corp. "Zeston" and "Hi-Lo Temp Inserts" for fittings. Glass fiber or prefabricated elastomeric foam fittings 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, Armacell.

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 elastomeric 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. Specification Compliance:

ASTM-E-84
ASTM-C-534 Type I – Tubular, Type II – Sheet.
ASTM-D-1056, 2B1 – Tubular, Sheet.

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MIL-C-3133B (MIL STD 670B) Grade SBE-3
MIL-P-15S280J, Form T, Form S.

4. Manufacturers: Armacell, Nomaco, K-Flex, Aeroflex USA, Inc.

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, Relief, and Outside Air Ductwork, and all ductwork connected to energy recovery units: 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 degrees 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 4" 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, relief, and outside air ductwork, and all ductwork connected to energy recovery units, 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.

2.3 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:

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1. A rigid 3.75 PCF phenolic foam pipe insulation designed to support pipe sizes up to and including 6” iron pipe size.

2. A rigid 5 PCF phenolic foam pipe insulation designed to support pipe sizes from 8” 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 - 3-1/2	3.75	9	6	20
4 – 6	3.75	12	9	18
8 – 18	5.0	18	12	16
20 – 30	5.0	24	18	14

I. Manufacturer: Tri-Balance insulated saddles as made by Buckaroos, Inc., Aerofix-U as made by Aeroflex USA, Inc.

PART 3 – EXECUTION

3.1 INSTALLATION – GENERAL

A. Do not install until systems have been tested and meet requirements.

B. Do not install until building is enclosed.

C. Heavy work which may damage insulation shall have been completed in the vicinity of the insulation work.

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D. 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.

E. All installations shall be made by skilled craftsmen regularly engaged in this type of work.

F. Insulation shall be continuous thru-wall, ceiling and floors.

G. Metal shields, 16 gauge galvanized, shall be installed between hangers and pipe insulation.

H. Pipe, ductwork and equipment shall be clean and dry prior to insulating.

I. Install all insulation per manufacturer's instructions.

J. 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.

3.2 PIPE INSULATION – TYPES & THICKNESSES

A. Provide fiberglass insulation of thickness specified on:

1. Refrigerant Piping: Interior locations, exposed and concealed for suction lines and hot gas bypass lines, if applicable. (NOTE: Insulate liquid line if metering device is mounted at the condensing unit.) Option: Flexible closed cell insulation

Suction Line:
1/2" for piping 1-1/4" and below
1" for piping 1-1/2" and larger

Hot Gas Bypass: (Liquid Line)
1" for piping 1-1/4" and below
1-1/2" for piping 1-1/2" and larger

B. Provide flexible closed cell insulation of thickness specified on:

1. Refrigerant Piping: Exterior Locations for suction lines and hot gas bypass lines, if applicable. (NOTE: Insulate liquid line if metering device is mounted at the condensing unit.)

Suction Line:
1/2" for piping 1-1/4" and below
1" for piping 1-1/2" and larger

Hot Gas Bypass: (Liquid Line)
1" for piping 1-1/4" and below
1-1/2" for piping 1-1/2" and larger

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2. 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 where 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.

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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

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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 23 02 00 for HVAC General Provisions

C. Refer to Section 23 02 10 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. Fans and AHU's
2. Suspended Fans, H&V Units

1.3 REFERENCE STANDARDS

A. Refer to Section 23 02 00 for a general description of requirements applying to this section.

1.4 QUALITY ASSURANCE

A. Refer to Section 23 02 10 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 23 02 00.

B. Submit the following:

1. Shop drawings
2. Product data

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.

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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. Fans and Air Handling Units:

1. For slab on-grade installations, provide:

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a. Type NRC = Pads, Washers and Bushings: Pads shall be felt, cork, neoprene waffle, neoprene and cork sandwich, neoprene and fiberglass, neoprene and steel waffle, or reinforced duct and neoprene. Washers and bushings shall be reinforced duct and neoprene. Size pads for a maximum load of 50 pounds per square inch.

OR

a. Type SP – NR = Double Deflection Neoprene: Shall include neoprene covered steel support plated (top and bottom), friction pads, and necessary bolt holes. Design isolators to support loads up to 50 pounds per square inch.

2. For floors above-grade, up to 40 ft. span, provide:

a. Type SW = Spring Isolators: Shall be free-standing, laterally stable and include acoustical friction pads and leveling bolts. Isolators shall have a minimum ratio of spring diameter-to-operating spring height of 1.0 and an additional travel to solid equal to 50 percent of rated deflection.

b. Type PBSRA - Combination Neoprene and Spring: Vibration hanger shall contain a spring and double deflection neoprene element in series. Spring shall have a diameter not less than 0.8 of compressed operating spring height. Spring shall have a minimum additional travel of 50 percent between design height and solid height. Spring shall permit a 15 degree angular misalignment without rubbing on hanger box.

c. Thrust Restraints: Restraints shall provide a spring element contained in a steel frame with neoprene pads at each end attachment. Restraints shall have factory preset thrust and be field adjustable to allow 1/4" maximum movement when the fan starts and stops. Restraint assemblies shall include rods, angle brackets and other hardware for field installation.

B. Suspended Fans and H&V Units

1. For floors above-grade, up to 40 ft. span, provide:

a. Type SW = Spring Isolators: Shall be free-standing, laterally stable and include acoustical friction pads and leveling bolts. Isolators shall have a minimum ratio of spring diameter-to-operating spring height of 1.0 and an additional travel to solid equal to 50 percent of rated deflection.

b. Type PBSRA - Combination Neoprene and Spring: Vibration hanger shall contain a spring and double deflection neoprene element in series. Spring shall have a diameter not less than 0.8 of compressed operating spring height. Spring shall have a minimum additional travel of 50 percent between design height and solid height. Spring shall permit a 15 degree angular misalignment without rubbing on hanger box.

c. Thrust Restraints: Restraints shall provide a spring element contained in a steel frame with neoprene pads at each end attachment. Restraints shall have factory preset thrust and be field adjustable to allow 1/4" maximum movement when the fan starts and stops. Restraint assemblies shall include rods, angle brackets and other hardware for field installation.

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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. Provide heat shields where elastomers are subject to high temperatures.

5. Extend bases for pipe elbow supports at discharge and suction connections at pumps. Pipe elbow supports shall not short circuit pump vibration to structure.

6. Non-rotating equipment such as heat exchangers and convertors shall be mounted on isolation units having the same static deflection as the isolation hangers or support of the pipe connected to the equipment.

7. 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.

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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

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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 23 02 00 for HVAC General Provisions

C. Refer to Section 23 02 10 for HVAC Basic Materials & Methods.

1.2 DESCRIPTION OF WORK

A. This Section includes labor, material, equipment and supervision to for the following:

1. Condensing Unit (Less than 10 Tons)
2. Ductless Split System Cooling Unit

1.3 REFERENCE STANDARDS

A. Refer to Section 23 02 00 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 23 02 10 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.

C. Verification of Fluid Cooler Performance:

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1. Manufacturer shall have a thermal performance testing program for water cooling towers certified by the Cooling Technology Institute (CTI) in accordance with CTI Specification Standard STD-201. Manufacturer's performance guarantees or performance bonds shall also be accepted.

2. Unit Sound Performance ratings shall be tested and certified according to CTI ATC-128 standard. Sound ratings shall not exceed specified ratings.

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.
2. 1/4" = 1'-0" scale layout of all equipment in Mechanical Room.

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 CONDENSING UNIT (Less than 10 Tons)

A. General:

1. Provide air-cooled condensers in accordance with the performance schedule shown on the plans.

2. Install them as shown on the plans in accordance with:

- The manufacturer's recommendations and
- All applicable national and local codes.

3. UL (CSA) approved.

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4. Leak, pressure and functionally tested at the factory to assure a trouble-free start-up after installation.

5. In current production with published literature available to check performance, limitations, specifications, power requirements, dimensions, operation and appearance.

B. Condenser Coils:

1. Shall be draw-thru, with manufacturer's standard wire guards.

2. Shall be constructed of copper tubes arranged in staggered rows and mechanically expanded into aluminum fins.

C. Condenser Fan Motors:

1. Shall be directly connected to the condenser fans.

2. Shall have permanently lubricated ball bearings.

3. Shall have inherent overload protection.

4. Motors shall be of the permanent split-capacitor type.

5. Condenser fans shall be arranged for vertical discharge of the condenser air, with manufacturer's standard wire guards.

D. The wiring for each unit shall include:

1. A 24-volt temperature control circuit.

2. High and low-pressure circuits.

3. Condenser fan motor controls to assure stable operation of ambient temperatures down to 0 degrees F.

4. Condenser fan and compressor contactor.

E. The refrigerant piping for each system shall include:

1. A strainer-drier,
2. A moisture indicating sight glass, and
3. Service access valves.
4. Locking type, tamper resistance caps on all refrigerant access ports.

The strainer-drier and sight glass may be shipped separately for field installation.

F. Manufacturer: Carrier, Lennox, Daikin McQuay, Trane, York.

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

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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 UNIT

A. Air conditioning system shall be a Mitsubishi Electric Series PK split system. The system shall consist of a compact 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 210 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 2015 IECC Standards.

B. The indoor unit shall be factory assembled and wired. The casing shall have a white finish. The evaporator fan shall be an assembly with line flow fans direct driven by a single motor. The fan shall be 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. 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. The unit electrical power shall be 115 volts, 1 phase, 60 hertz.

C. The control system shall consist of two (2) microprocessors interconnected by a single non-polar two-wire cable as supplied. Wiring shall run from indoor unit to controller direct. When running longer lengths or more than one set of remote controller wires together, a double insulated, two-wire cable equivalent to that provided; e.g. Belden 9407 cable, is mandatory or use shielded two-wire cable. One microprocessor shall be factory wired and located within the indoor unit. It shall have the capability of sensing return air temperature and indoor coil temperature; receive and process commands from the remote controller; provide emergency operation; and control the outdoor unit. The microprocessor within the wall-mounted remote controller shall provide automatic cooling; display setpoint and room temperature; a 24-hour on/off timer so that automatic operation can be set on the timer at one-hour intervals from one to twenty-four hours; have self-diagnostic function display; check mode for memory of most recent problem; control system shall control continued operation of the air sweep louvers; and provide on/off and system/mode function switching. Normal operation of the remote controller provides individual system control in which one remote controller and the indoor unit shall be 12 volts, D.C. The control voltage between the indoor unit and the outdoor unit shall be 12 volts D.C. Both 12 VDC shall be generated from the indoor unit microprocessor board. The system shall be capable of automatic restart when power is restored after power interruption. System shall include twenty function self-diagnostics including total hours of compressor run time.

D. The outdoor unit shall be completely factory assembled, piped and wired. The casing shall be fabricated of galvanized steel, bonderized and finished with baked enamel. The unit shall be furnished with one (1) direct drive, propeller type fan arranged for horizontal discharge. The motors shall have inherent protection, be of the permanently lubricated type and resiliently mounted for quiet operation. The fans shall be provided with a raised guard to prevent contact with moving parts. The compressor shall be of the high-performance rotary type with crankcase heater, accumulator and internal thermal overloads. The compressor shall be mounted so as to avoid the transmission of vibration. The

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refrigeration system shall be equipped with high pressure switch and have the capability to operate with a maximum height difference of 130 feet and overall refrigerant tubing length of 130 feet between indoor and outdoor sections without the need for line size changes, traps or additional oil. Refrigerant flow from the condenser shall be controlled by means of a capillary tube. The condenser coil shall be of non-ferrous construction with smooth plate fins bonded to copper tubing. The coil shall be protected with smooth plate fins bonded to copper tubing. The coil shall be protected with an integral metal guard. The unit shall be controlled by the microprocessor located in the indoor matching unit. A built-in, low-ambient controller will allow cooling to 0 deg. F outdoor temperature. The unit electrical power shall be 208 volts, 1 phase, 60 hertz.

E. Accessories: A SPST relay with coil voltage to match the operating signal of the DDC System and a "PAC-715AD" cable from Mitsubishi.

F. Manufacturers: Airdale, Carrier, EMI, LG HVAC, Daikin McQuay, Mitsubishi Electric, Panasonic, Sanyo A.C. Products, Samsung.

2.3 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 process cooling unit shall be a Sanyo 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 hard wired, wall-mounted remote-control enclosure shall include an LCD display providing a continuous display of operating status and condition. A 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.

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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.

3. Provide a self-contained condensate pump, mounted within wall mounted evaporator.

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 McQuay, EMI, LG HVAC, Mitsubishi Electric, Panasonic, Sanyo A.C. Products, Samsung.

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 26.

END OF SECTION

NOT FOR BIDDING PURPOSES

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 23 02 00 for HVAC General Provisions

C. Refer to Section 23 02 10 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. Flexible Connections
4. Dampers
5. Fire Dampers
6. Air Diffusers, Registers and Grilles
7. Louvers
8. Duct Access Doors (Interior)
9. Roof-Mounted Intake/Exhaust Ventilators
10. Fabric Air Dispersion Ductwork

1.3 REFERENCE STANDARDS

A. Refer to Section 23 02 00 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.)

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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 23 02 10 for a general description of requirements applying to this Section.

1.5 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 23 02 00.

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 ¼".

a. Shop drawings shall indicate the sizes and lengths of each section of ductwork as well as all system components such as coils, VAV boxes, 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,

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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 2" 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.

B. Rectangular ducts for 2" W.G. or less, positive or negative pressure shall be per SMACNA Table 1-7. Longitudinal seams shall be Pittsburgh Lock Type 1-l 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.

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 manufacturers 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. For corrosive or moist conditions, use coating designation G-90.

1. Where the outer surface of the duct is exposed in finished spaces and is <u>not</u> scheduled for insulation, duct material shall be galvannealed, 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.

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F. Aluminum Rectangular Ductwork:

1. Aluminum ductwork shall be two B.& S. gauges heavier than specified for the equivalent width steel ductwork. Bracing, supports and joints shall be as specified for steel ductwork.

2. Aluminum ducts shall be used where the ducts are concealed when exhausting saturated air from dishwashing, showers, outside air intakes and similar designated spaces.

3. Dishwashing exhaust ducts shall be made watertight by means of silicone or 3M duct sealant properly installed and compressed at each joint and seam.

G. Kitchen exhaust duct shall have all joints, seams, penetrations and duct-to-hood collar connections with continuous, external, liquid-tight welds.

1. Carbon Steel: Fabricate from 16-gauge, ASTM-A569 hot rolled or ASTM-A366.

2. Stainless Steel: Fabricate from 18-gauge, Type 304, 2D finish.

3. Option: Factory fabricated grease duct system, U.L. listed, which meets all the requirements of NFPA 96.

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 <u>not</u> scheduled for insulation, duct material shall be galvannealed, 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.

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2. Duct 37" - 60" diameter: Companion angle Vanstone with full face gaskets having bolt holes punched through prior to insertion of bolts. Gasketing shall be 1/8" thick. Joint is per SMACNA Figure 3-2, joint RT -2 and RT -2A.

3. For all dust collection and particulate carrying duct, SMACNA Figure 3-2, joint RT -3 up to 16" diameter and RT -2 or RT -2A are the only acceptable joints. RT -3 joints do not require any additional sealant as long as the band has gasketing installed by manufacturer. Joints RT -2 and RT -2A require full face gaskets having bolt holes punched through prior to insertion of bolts. Gasketing shall be 1/8" thick. There shall be no fasteners penetrating the duct for collection systems.

4. In lieu of beaded slip connections or Vanstone angle ring connections (the above-mentioned joints), there are proprietary connections that may be used, as long as they meet the pressure criteria set forth in this specification.

2.3 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.

2.4 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, United Enertech.

2.5 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.

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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 ½ 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, United Enertech.

2.6 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. Perforated face air diffusers shall be nominal 24 X 24 size, with borders suitable for lay-in ceiling tile application. Diffusers shall provide one, two, three or four-way blow on the drawings. Provide diffusers with perforated face, 3/16" diameter holes on 1/4" staggered centers. Discharge pattern shall be easily adjusted by unlatching and dropping the perforated face, then rotating the pattern controllers. Diffusers shall be heavy gauge steel back pan and face. Provide adjustable control grid with volume damper. Damper adjustment shall be through the diffuser face. Finish shall be factory primed and painted with a baked-on white enamel finish.

   a. Manufacturer: Price Model PDMC

OR

1. Perforated face radial air diffusers shall be nominal 24x24 or 24x48 module size with borders suitable for lay-in ceiling tile application. Diffusers shall provide two-way blow. Provide diffusers with 51 % free area perforated face, 3/16" diameter holes on 1/4" staggered centers. Diffusers shall be heavy gauge steel back pan, maximum 6" deep and face maximum 5/8" deep reveal on face plate. Finish shall be factory primed and painted white.

   a. Face and air chamber shall be provided with two retainer cables.

   b. Manufacturer: Price HCF

2. Square Louvered Diffuser Face:

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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.

c. Finish: Matte white finish.

d. Manufacturers: Price Model SMD

3. 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.

4. Drum Diffusers:

a. Drum diffusers shall be vertical rotating louvered type. Diffusers shall be extruded aluminum with a felt seal around rotating drum. Drum shall rotate up to 30 degrees off center, each direction.

b. Drum diffusers shall have vertical adjustable vanes for horizontal control.

5. Square Ceiling Supply Diffuser:

a. Square panel ceiling diffusers shall have a 22-gauge steel face panel that captures a secondary 22-gauge panel. The Price ASPD shall have a heavy gauge aluminum face panel that captures a secondary heavy gauge aluminum panel. The exposed surface of the face panel shall be smooth, flat, and free of visible fasteners. The back of the face panel shall have an aerodynamically shaped, rolled edge to ensure a tight horizontal discharge pattern.

b. The back pan shall be one piece precision die-stamped and shall include an integrally drawn inlet. The diffuser back pan shall be constructed of 22-gauge steel. The finish shall be #26 white. The finish shall be a baked on anodic acrylic paint, with a pencil hardness of HB to H.

c. Back shall have molded insulation blanket. The insulation shall be R-6, foil-backed, and provide an additional 1-inch gap around the neck to install insulated flex duct.

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d. Price Model SPD

6. Round Ceiling Supply Diffuser:

a. Round plaque ceiling diffusers shall be constructed of 18-gauge steel and heavy gauge aluminum plaque face. The exposed surface of the plaque shall be smooth and flat. The airflow discharge pattern shall be field adjusted from horizontal to vertical by repositioning the plaque assembly using the adjusting screws. The plaque assembly shall be constructed as a single inner assembly and must be easily removable.

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.

c. Price Model RPD

7. Round Cone Diffusers:

a. Adjustable round cone diffuser, welded steel construction with round neck and removable inner assembly of cones.

b. Air pattern shall be field adjustable from horizontal to vertical.

c. Finish: Matte white finish

d. Price Model RCD

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. Wall Supply Registers:

a. Provide manufacturer's standard wall registers where shown; of size, shape, capacity, type of materials and components indicated.

b. Register Materials: Steel construction: Manufacturer's standard stamped sheet steel frame and adjustable blades.

c. Register Faces: Horizontal Straight Blades: Vertical blades, individually adjustable, at manufacturer’s standard spacing.

d. Register Patterns: Double Deflection: 2 sets of blades in face, rear set at 90 degrees to face set.

e. Register Finishes: Aluminum Enamel: Air-dried aluminum enamel prime finish.

3. Direct Spiral Duct-Mounted Supply Grilles:

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a. Aluminum supply grilles shall be direct spiral duct-mounted supply grilles, double deflection of the sizes and mounting types as shown on the plans. The deflection blades shall be available parallel to the long or short dimension of the grille or register. All supply grilles shall be constructed with radius end caps and foam gaskets for a tight seal to the duct diameter. All supply grilles shall be constructed with a border.

b. Blades shall be constructed of heavy duty extruded aluminum and shall be spaced ¾" apart. Blades shall extend completely through the side frame on each side to ensure stability. Blades shall be individually adjustable without loosening or rattling and shall be securely held in place with tension wire.

c. Air scoop damper/extractor shall be constructed of heavy duty aluminum. The ASD must be operable from the face with a screwdriver.

d. The grille finish shall be as selected by the Architect.

4. Supply Grilles (SG):

a. Aluminum supply grilles shall be available parallel to the long dimension of the grille. All supply grilles shall be constructed with a 11/4 inch wide heavy aluminum border having a minimum thickness of 0.040-0.050 inch. Outer borders shall be assembled and interlocked at the four corners and mechanically staked to form a rigid frame. Screw holes shall be countersunk for a neat appearance.

b. Blades shall be constructed of heavy duty aluminum and shall be contoured to a specifically designed airfoil cross section to meet published performance data. Where indicated in drawing schedule or plans opposed-blade volume damper shall be constructed of heavy gauge steel or aluminum.

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 22

5. 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

6. Return Grille (RG):

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a. Return grilles shall provide a free area of at least 90%. Outer borders shall be constructed of heavy extruded aluminum with a thickness of 0.040-0.050 inch and shall have countersunk screw holes for a neat appearance. Aluminum grid shall be 1/2 x 1/2 x 1/2 inch.

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.

c. Price Model 80

7. Supply, Return, Exhaust and Transfer Grilles (SG, RG, EG & TG):

a. Grilles shall be available parallel to the long dimension of the grille. Construction shall be of steel with a 11/4-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 520FL(SG), 535 FL(RG,EG & TG)

8. Ceiling Return Filter Grille (CR):

a. Return filter grilles shall be of size and mounting type as shown on the drawings and schedules.

b. Return grilles shall provide minimum free area of 90%.

c. Borders shall be constructed of heavy extruded aluminum with countersink holes or frame suitable for ceiling finish in each room.

d. The four corners shall be interlocked and mechanically staked to form a rigid frame.

e. Aluminum grid core shall have ½ x ½ x ½ inch openings

f. Return grilles shall be provided with a filter frame that will accommodate a standard 1-inch thick disposable filter to fit the specified duct size. Filter shall be grille module size minus 4 inches. Filter capacity shall be as scheduled on the drawings.

g. Return grille finish shall be white powder coat.

h. Price Model 535FF

9. Ceiling Louvered Return Filter Grille (CR):

a. Return filter grilles shall be of size and mounting type as shown on the drawings and schedules.

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b. Borders shall be constructed of steel with countersink holes or frame suitable for ceiling finish in each room.

c. The four corners shall be interlocked and mechanically staked to form a rigid frame.

d. Deflection blades shall be ½ inch spacing, 45° deflection.

e. Return grilles shall be provided with a filter frame that will accommodate a standard 1-inch thick disposable filter to fit the specified duct size. Filter shall be grille module size minus 4 inches. Filter capacity shall be as scheduled on the drawings.

f. Return grille finish shall be white powder coat.

g. Price Model 535FF

D. Manufacturers: Provide diffusers, registers and grilles of one of the following:

Anemostat	Price
Carnes Co.	Titus
Krueger	Tuttle & Bailey
Metalaire	Nailor Industries

2.7 LOUVERS

A. All wall louvers for intake and exhaust shall be stationary stormproof type.

B. Construction shall be of extruded aluminum with 0.081-inch-thick blades and frames and all fastening shall be aluminum or stainless steel.

C. An aluminum expanded metal bird screen with frame shall be secured to the rear face of the louver assembly.

D. Depth of the louver frame shall be 4",6",8” unless otherwise indicated.

E. Performance Ratings:

1. Free Area: Louvers shall have a minimum of 50% free area based on a 48-inch-high by 48-inch-wide size.

2. Air Performance: Not more than 0.08 inch WG static pressure drop at 700 FPM free area intake velocity.

3. Water Penetration: Maximum of 0.01 ounces per square foot of free area at an air flow of 750 feet per minute free area velocity when tested for 15 minutes.

F. The surface areas shall be:

- a mill finish coated with clear butyrate lacquer.
- factory duranodic finish of shade selected by Architect.

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- factory anodized finish of color selected by Architect.

G. Manufacturers: Airstream Products Co., Air Balance, Inc., Carnes Co., Arrow Co., Empco, Pottorff, Cesco, Lloyd Industries, Inc., Ruskin, Louvers & Dampers, United Enertech, NCA Manufacturing, Inc.

2.8 DUCT ACCESS DOORS (Interior Locations)

A. SMACNA standard duct access doors shall be fabricated with 22-gauge galvanized steel door and frame with double wall construction.

1. Doors shall be fabricated of aluminum when installed in aluminum ductwork and stainless steel to match special duct systems.

B. Continuous piano type hinge, same material as door.

C. Latches shall be sash type locks equal to Ventlock 100 latches.

1. Doors 16" and under shall have one latch.
2. Doors over 16" shall have two latches.

D. Door seals shall be foam gasket material continuously bonded to perimeter of door frame.

E. Door insulation shall be 1" thick fiberglass, minimum 1.5 pcf density.

F. Doors shall be able to withstand 3" W.C. static pressure up to 12" x 12" in size; 2" W.C. above that size.

G. Makes: Cesco Products, Karp Co., Nailor-Hart Industries, Pottorff, Lloyd Industries, Inc., Ductmate Industries, Inc.

2.9 ROOF-MOUNTED INTAKE/EXHAUST VENTILATORS

A. Heavy gauge aluminum construction.

B. Hinged hood.

C. Hood underside insulated with 1" fiberglass.

D. Aluminum insect screen.

E. Provide 12-inch-high insulated roof curb with blocking to secure equipment, and integral cant to accommodate configuration of roofing material/membrane.

F. Manufacturers: Penn Ventilator Co., Carnes Co., Greenheck, Loren-Cook or Acme.

2.10 FABRIC AIR DISPERSION DUCTWORK

A. Product shall be constructed of a coated woven fire retardant fabric complying with the following physical characteristics:

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1. Type: S-Sedona, V-Verona, D-DuraTex, T-TufTex

2. Configuration:
   a. Standard: round
   b. Surface: D-shape or Quarter round.

3. Fabric Construction:
   a. Fiberglass reinforced polyester twill. (S)
   b. Plain polyester weave. (D) (T) (V)

4. Coating:
   a. Porous. (S) (V)
   b. Non-porous. (D) (T)
   c. Antimicrobial agent, 99% effective after 10 laundry cycles, per AATCC Test Method 100 (S)

5. Weight:
   a. 5.2 oz. per square yard. (V)
   b. 5.5 oz. per square yard. (D)
   c. 6.7 oz. per square yard. (S)
   d. 8.2 oz. per square yard. (T)

6. Permeability:
   a. None (D) (T)
   b. 2 cfm per square foot @ 0.5" WC. (S) (V)

7. Color:
   a. Standard color as selected by the Architect
   b. Custom color as selected by the Architect

8. Warranty:
   a. 5 years on products for the fabric system. (D) (V)
   b. 10 years on products for the fabric system. (S) (T).

9. Temperature Range: 0 degrees F to 180 degrees F

10. Fire Retardancy: Classified by Underwriters Laboratories in accordance with the 25/50 flame spread/smoke developed requirements of NFPA 90-A.

B. Systems Fabrication Requirements:

1. Air dispersion accomplished by round vent, and consist of open orifices rather than a mesh style vent to reduce maintenance requirements (common to mesh style).

2. Size of and location of vents shall be specified and approved by manufacturer.

3. Inlet connection to metal duct via fabric draw band with anchor patches supplied by manufacturer. Anchor patches shall be secured to metal duct via. zip screw fastener - supplied by contractor.

4. Inlet connection includes zipper for easy removal / maintenance.

5. Lengths to include required zippers as specified by manufacturer.

6. System to include Adjustable Flow Devices to balance turbulence, airflow and distribution as needed. Flow restriction device shall include ability to adjust the airflow resistance from 0.06 - 0.60 in w.g. static pressure.

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7. End cap includes zipper for easy maintenance.

8. Fabric system shall include connectors to accommodate suspension system listed below.

9. Any deviation from a straight run shall be made using a gored elbow or an efficiency tee. Normal 90 degree elbows are 5 gores and the radius of the elbow is 1.5 times the diameter of the DuctSox.

C. Design Parameters:

1. Fabric air diffusers shall be designed from 0.25" water gage minimum to 3.1" maximum, with 0.5" as the standard.

2. Fabric air diffusers shall be limited to design temperatures between 0 degrees F and 180 degrees F.

3. Design CFM, static pressure and diffuser length shall be designed and approved by the manufacturer.

4. Do not use fabric diffusers in concealed locations.

5. Use fabric diffusers only for positive pressure air distribution components of the mechanical ventilation system.

D. Suspension Hardware:

1. Internal Hoop System: Provide a factory fabricated retention system consisting of an internal 360° hoop system spaced on maximum 5’ centers. Each hoop shall be fabricated of lightweight aluminum ring and tubing with negligible effect on airflow static resistance. The rings located at the inlet and end of run shall include tensioning anchor clips to secure the fabric to the hoop system. Sizes shall include 8” to 36” diameter in 2” increments. The system shall be installed with a one row suspension system located 1.5” above top dead center of the fabric duct system. System attachment shall be either cables or u-track using gliders spaced 12” on center.

E. Manufacturer: Ductsox, FabricAire, KE Fibertec.

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.

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 for steel ductwork and aluminum for aluminum ductwork.

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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 23 02 30.

J. Ductwork on the roof shall be supported by an engineered, prefabricated hanger system specifically designed for installation on the roof without roof penetrations, flashing or damage to the roofing material. The system shall consist of bases made of high density polypropylene plastic with additives for UV protection, hot dipped galvanized structural steel frames, hangers, fasteners, rods, etc. The system shall be completed and designed to fit the ductwork installed

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under actual conditions of service. The system shall be furnished as manufactured by PHP Systems & Design or Anvil International Haydon H-Block.

3.2 LOUVERS

A. When open louvers are provided on a job, and the louver is open on the back, the contractor shall provide a 2" deep drip pan. Pan shall extend the full length of the louver. Drip pan shall be fabricated from a minimum of 24-gauge galvanized sheet steel. Cross break pan for rigidity. All seams to be welded.

B. Drip pans shall be securely fastened to building structure. Do not hang pans from ductwork, piping systems or equipment. Contractor shall submit shop drawings, showing pan detail and methods of support.

3.3 FLEXIBLE AIR DUCT

A. When flexible duct is used for final connection between duct mains or 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.

3.4 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.

3.5 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

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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.

3.6 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.

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F. Instruments must be adjusted to zero reading before pressure is applied.

3.7 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.

3.8 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

NOT FOR BIDDING PURPOSES

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 23 02 00 for HVAC General Provisions

C. Refer to Section 23 02 10 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. Centrifugal Direct Drive Cabinet Fan
2. Ceiling Fan

1.3 REFERENCE STANDARDS

A. Refer to Section 23 02 00 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 23 02 10 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

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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 CENTRIFUGAL DIRECT DRIVE CABINET FAN

A. Fan shall be centrifugal, direct driven in-line type. The fan housing shall be of the square design, constructed of heavy gauge galvanized steel and shall include square duct mounting collars. One side of the housing shall be equipped with a hingeable service door assembly supporting the motor, wheel and inlet cone. The door assembly must swing out for cleaning, inspection, or service without dismantling the fan in any way.

B. Fan wheel shall be of the aluminum backward inclined centrifugal type. Wheels shall be dynamically and statically balanced. Fan motors shall be permanently lubricated, heavy duty type carefully matched to the fan loads.

C. Flexible wiring leads shall be provided from the fan motor to an external mounted junction box and disconnect switch permitting the service door to be hinged without disconnecting the field wiring.

D. All fans shall bear the AMCA Certified Rating Performance Seal for both air and sound performance.

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E. Manufacturer: Penn Ventilator, Greenheck, Carnes, Loren-Cook, American Coolair/ILG, 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 23 09 50 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 Contractors 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

NOT FOR BIDDING PURPOSES

SECTION 23 07 20

INDOOR FUEL-FIRED HEATERS

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 23 02 00 for HVAC General Provisions

C. Refer to Section 23 02 10 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. High Efficiency, Gas-Fired Furnace
2. High Efficiency, Gas-fired Unit Heater

1.3 REFERENCE STANDARDS

A. Refer to Section 23 02 00 for a general description of requirements applying to this section.

B. Media type air filters shall comply with U.L. Standard 900.

1.4 QUALITY ASSURANCE

A. Refer to Section 23 02 10 for a general description of requirements applying to this Section.

1.5 SUBMITTALS

A. Submit shop drawings in accordance with Section 23 02 00.

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.

NOT FOR BIDDING PURPOSES

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 GAS-FIRED DUCT FURNACES

A. Provide a gas-fired duct furnace in accordance with the schedule shown on the drawings.

1. Install each furnace as shown on the plans in accordance with the manufacturer's recommendations and all applicable national and local codes.

2. In current production with published literature available to check unit performance, limitations, specifications, power requirements, dimensions, operation, and appearance.

B. Units shall be completely factory assembled, piped, wired and test fired. (Units shall include special orifices for high altitude applications.) All units must be (AGA) (CGA) Certified and conform with the latest ANSI Standard for safe and efficient performance.

C. Performance Ratings: Units shall have at least a 77% thermal efficiency rating.

D. Heating Capacity: Btu/Hr. rated heating output when heated by natural gas. Gas heating capacity is sea level rating.

E. Refer to Schedule. (Gas heating capacities are sea level ratings)

F. Jacketing:

1. Casing and trim pieces shall be fabricated from 20-gauge cold-rolled steel and finished on all four sides with baked enamel finish.

2. Duct discharge flanges shall be provided for use with field ductwork.

G. Heat Exchanger shall consist of tube sections not lighter than 20 gauge and connecting plates not lighter than 18 gauge. Heat exchanger shall be 100% welded. Material shall be 409 stainless steel and shall be equipped with a stainless-steel burner shade.

H. Draft Diverter:

1. Draft Diverter shall be no lighter than 20 gauge.
2. Draft Diverter shall be corrosion resistant 409 stainless steel.

I. Burner:

1. Gas burner shall be atmospheric type.

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2. Burners shall be corrosion resistant 409 stainless steel.

3. Service access to the burners, pilot and orifices shall be provided by (a removable bottom access panel) (a side access burner drawer which slides out from the side of the unit).

4. Burner shall be welded at each port to maintain flame integrity and then spot welded. V-shaped stainless-steel flame spreader shades ports from dust and rust.

5. Burner shall be individually removable for ease of inspection and servicing.

6. Gas Burner Safety Controls: Thermo-couple sensor prevents opening of solenoid gas valve until pilot flame is proven and stops gas flow on ignition failure.

J. Controls:

1. A factory installed junction box shall be provided for all power connections. A 24-volt transformer high limit and a fan time delay shall be provided.

2. High Limit Control: Fixed stop at maximum permissible setting, deenergizes burner on high bonnet temperature and re-energizes when temperature drops to lower value.

3. Units:

a. Units shall be provided with a 24-volt combination automatic gas valve, including main operating valve and pilot safety shutoff, pressure regulator, manual main and pilot shutoff valve, and adjustable pilot valve.

b. Gas valve shall be suitable to a maximum inlet pressure of 0.5 psi (14" W.C.) on natural gas.

4. The unit shall be suitable for natural gas and have two-stage gas control and intermittent pilot ignition with electronic flame supervision.

5. Fan Control: A fan time delay switch shall be provided and shall be controlled by a low voltage thermostat.

K. Operating Controls:

1. Room Thermostat: Low voltage, two-stage to control burner operation, heater stages, to maintain temperature setting.

L. Accessories:

1. Units shall be provided with aluminized steel drain pans.
2. Electronic modulating gas control valve.
3. Safety redundant gas valve.

M. Manufacturers: Reznor, Sterling, Trane

NOT FOR BIDDING PURPOSES

2.2 GAS-FIRED FURNACE

A. Provide gas-fired furnace in accordance with the schedule shown on drawings.

1. Install each furnace as shown on the plans in accordance with:

   - The manufacturer's recommendations and
   - All applicable national and local codes.

2. In current production with published literature available to check unit performance, limitations, specifications, power requirements, dimensions, operation and appearance.

3. Completely assembled for one-piece shipping and rigging.

4. Insulated with aluminum-faced fiberglass for thermal and acoustical properties.

5. A.G.A. tested and listed for its intended application and certified to ETC for both capacity and efficiency, in accordance with DOE test procedures.

6. Covered by a one-year limited parts warranty on the unit and a ten-year limited warranty on the heat exchanger.

B. Casing:

1. External panels of steel with a baked enamel finish, embossed for added strength.

2. Lift-lock front panels which are easily removable, for maintenance, service and adjustment of all internal controls and components.

3. A heat exchanger which shall be of continuous seam welded multi- section design with individually removable sections.

4. Burners constructed of formed steel tube with multiple ports and connected by a lanced port carryover tube.

5. A blower which shall be dynamically and statically balanced, of either direct-drive or belt-drive variety.

C. Motor:

1. All direct-drive motors must have three or more speed taps and have inherent internal overload protection.

2. A standard cleanable filter for either bottom or side return application.

3. Adjustable fan/limit control.

4. Auxiliary limit control on counterflow and horizontal models.

5. Provide control transformer as required.

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6. Secondary limit control except HG/HS models.

7. Blower door interlock switch.

8. Standard air conditioning blower relay.

D. Spark Ignition:

1. Solid state ignition control for intermittent proven pilot operation.

2. Matching redundant gas valve.

3. Igniter and sensing functions provided through the same lead wire.

4. Automatic spark ignition pilot.

E. Manufacturers: Trane, York/Johnson Controls, Carrier, Lennox.

2.3 HIGH EFFICIENCY, GAS-FIRED FURNACE

A. Provide high efficiency, gas-fired furnace in accordance with the schedule shown on drawings.

1. Install each furnace as shown on the plans in accordance with:

- The manufacturer's recommendations and
- All applicable national and local codes.

2. In current production with published literature available to check unit performance, limitations, specifications, power requirements, dimensions, operation and appearance.

3. Completely assembled for one-piece shipping and rigging.

4. Insulated with aluminum-faced fiberglass for thermal and acoustical properties.

5. A.G.A. tested and listed for its intended application and certified to FTC for both capacity and efficiency in accordance with DOE test procedures. AFUE shall be 95.5.

B. Casing:

1. External panels of steel with a baked enamel finish, embossed for added strength.

2. Lift-lock front panels which are easily removable, for maintenance, service and adjustment of all internal controls and components.

3. A heat exchanger which shall be of continuous seam welded multi- section design with individually removable sections.

4. Burners constructed of formed steel tube with multiple ports and connected by a lanced port carryover tube.

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5. A blower which shall be dynamically and statically balanced.

C. Motor:

1. All direct-drive motors must have three or more speed taps and have inherent internal overload protection.

2. A standard cleanable filter for either bottom or side return application.

3. Adjustable fan/limit control.

4. Auxiliary limit control on counterflow and horizontal models.

5. Provide control transformer as required.

6. Blower door interlock switch.

7. Standard air conditioning blower relay.

D. Spark Ignition:

1. Solid state ignition control for intermittent proven pilot operation.

2. Matching redundant gas valve.

3. Igniter and sensing functions provided through the same lead wire.

4. Automatic spark ignition pilot.

E. Provide programmable seven-day heating/cooling thermostat with automatic changeover.

F. Provide concentric roof termination kit. Terminate in accordance with IFGC and all local code requirements.

G. Manufacturers: Carrier, Lenno, York/Johnson Controls.

2.4 HIGH EFFICIENCY, GAS-FIRED UNIT HEATER

A. Provide high efficiency, gas-fired furnace in accordance with the schedule shown on drawings.

1. Install each furnace as shown on the plans in accordance with:

- The manufacturer's recommendations and
- All applicable national and local codes.

2. In current production with published literature available to check unit performance, limitations, specifications, power requirements, dimensions, operation and appearance.

3. Completely assembled for one-piece shipping and rigging.

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4. Unit shall bear ETL design certification to ASNI Z83.8, latest revision, standard for “Gas unit Heater and Gas-Fired Duct Furnaces” for safe operation, construction, and performance.

B. Casing:

1. External panels of minimum 20-gauge aluminized steel with a minimum 7-mil polyester powder paint, baked enamel finish.

2. Panels which are easily removable, for maintenance, service and adjustment of all internal controls and components.

3. The unit shall be furnished with horizontal air deflectors which are adjustable to provide directional airflow control up or down.

4. The unit shall be equipped with tapped holes to accept 3/8-16 threaded rod for 4 suspension points.

C. Furnace Section

1. A heat exchanger which shall be of continuous 18-gauge aluminized steel tubes and headers design with individually removable sections.

2. Each heat exchanger tube shall be individually and directly flame-fired. The tube shall be crimped to allow for thermal expansion. The flue collar box shall be made of minimum 20-gauge AL29-4C stainless steel.

3. The thermal efficiency of the unit shall be minimum of 93% for all air flow ranges through the use of a secondary heat exchanger constructed of AL29-4C stainless steel to withstand condensing gas fire equipment.

D. Blower and Motor:

1. All direct-drive motors shall have inherent internal overload protection.
2. A blower which shall be dynamically and statically balanced.
3. Motor shall be factory wired, time delay relay control, totally enclosed single speed.
4. Provide control transformer, factory mounted and wired, 115/24VAC.
5. Standard residual heat blower relay, delay on to start, delay off to remove.

E. Spark Ignition:

1. Solid state ignition control for direct spark igniter on thermostat call for heat operation.

2. Single stage gas control with single stage combination gas control, ignition control, 100% full fe

3. Igniter and sensing functions provided through the same lead wire.

4. Automatic reset high limit switch mounted in the airstream to shut off gas supply in the event of overheating.

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5. Automatic reset high limit switch mounted on the power exhauster housing to shut ogg gas supply in the event of overheating flue gas temperatures.

6. Condensate drain line overflow switch to sense clogged line and shut down heater.

F. Provide single-stage room thermostat.

G. Provide concentric wall termination kit. Terminate in accordance with IFGC and all local code requirements.

H. Accessories as schedule on the drawings.

I. Manufacturers: Modine, Reznor, Sterling.

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 HEATERS

A. Install heaters and in accordance with manufacturer's installation instructions.

B. Uncrate units and inspect for damage. Verify that nameplate data corresponds with unit designation.

C. Hang units from building substrate. Mount as high as possible to maintain greatest headroom possible, unless otherwise indicated.

D. Support units with rod-type hangers anchored to building substrate.

E. Protect units with protective covers during balance of construction.

F. Provide minimum 4" high concrete pad under all floor-mounted equipment.

G. Perform field mechanical balancing in accordance with Section 23 09 50: 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

NOT FOR BIDDING PURPOSES

SECTION 23 07 22

GAS-FIRED INFRARED HEATERS

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 23 02 00 for HVAC General Provisions

C. Refer to Section 23 02 10 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. Gas-Fired Infrared Heaters

1.3 REFERENCE STANDARDS

A. Refer to Section 23 02 00 for a general description of requirements applying to this section.

1.4 QUALITY ASSURANCE

A. Refer to Section 23 02 10 for a general description of requirements applying to this Section.

1.5 SUBMITTALS

A. Submit shop drawings in accordance with Section 23 02 00.

B. Submit shop drawings and descriptive data for all equipment specified in this section.

C. Coordination Drawings: Plans, elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved.

1. Illustrations showing how equipment will be attached.
2. Items penetrating roof.
3. Vent and gas piping connections.

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

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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 GAS-FIRED INFRARED HEATER

A. Heater:

1. Two-stage infrared heaters shall be Re-Verber-Ray HL Series as manufactured by Detroit Radiant Products, Co-Ray-Vac, Schwank, Weather-Rite or Modine.

2. Two-stage infrared tube heaters shall be design certified by the American Gas Association (AGA) and comply with current Occupational Safety and Health Act (OSHA) requirements.

3. The supplier shall provide a manufacturer's published warranty covering the heater's stainless-steel burner assembly for a period of 10 years, combustion and radiant emitter tube assembly for a period of five (5) years and components utilized in the heater control assembly for a period of one (1) year.

B. Two-Stage Infrared Tube Heater Burner Controls:

1. The two-stage infrared tube heater must be AGA design certified to operate at an input differential of 30% between the low-fire and high fire modes.

2. Heater shall be equipped with a direct silicone carbide ignition system. Power supplied to each burner shall be 120 vac, 60 hz, 1 phase.

3. Heater controls shall include two (2) safety differential pressure switches.

4. Heater control assembly shall include staging indicator lights that define the unit's operating input ranges.

5. Burners shall operate under a negative pressure with gauges pulled through the exchanger pipe to a common exhauster pump. Each burner shall receive its combustion air independently.

6. The thermostats shall be two-stage operating on 24 volts.

   a. Digital programmable wall mounting type.
   b. Control transformer shall be internally mounted.

C. Two Stage Infrared Tube Heater Construction:

1. Heater's control housing shall be totally enclosed with an enameled steel exterior.

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2. Heater's combustion chamber shall be 4 OD, 16-gauge Titanium alloy aluminum steel finished with a high emissivity rated, corrosion resistant, black coating.

3. The condensate tail pipe shall be 4 inches, OD, 16 guage 304 stainless steel.

4. The heater's combustion chamber and radiant emitter tube shall incorporate a 4 slip fit connection held by a bolted clamp.

5. The silicone carbide igniter shall be readily accessible and serviceable without the use of tools.

6. Reflectors shall be of .025 polished aluminum with reflector end caps. Reflectors shall be rotatable from 0 to 45° when required. The reflector hanger system shall be designed to permit expansion while minimizing noise and rattles.

7. The heaters shall utilize a downstream turbulator baffle for thermal efficiency.

8. Heaters shall be equipped with a sight glass allowing a visual inspection of igniter and burner operation from the floor.

9. The two-stage infrared tube heaters shall be designed such that outside combustion air may be supplied. An air intake collar shall be supplied.

D. Exhauster Pumps:

1. Systems designed for condensing shall have a cast aluminum housing for corrosion resistance.

2. Motors ½ HP and larger shall be TEFC Type standard efficiency. Motors shall be equipped with thermal protection and capacitor starters.

E. Gas Connections: Heater shall be supplied with stainless steel flexible gas connectors.

F. Venting shall be per manufacturer's specifications.

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 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 units from building substrate. Mount as high as possible to maintain greatest headroom possible, unless otherwise indicated.

NOT FOR BIDDING PURPOSES

D. Support units with rod-type hangers anchored to building substrate.

E. Protect units with protective covers during balance of construction.

F. Perform field mechanical balancing in accordance with Section 23 09 50: TESTING AND BALANCING OF MECHANICAL SYSTEMS.

END OF SECTION

NOT FOR BIDDING PURPOSES

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 23 02 00 for HVAC General Provisions

C. Refer to Section 23 02 10 for HVAC Basic Materials & Methods.

D. Refer to Section 23 04 50 for Refrigeration Equipment – HVAC.

E. Refer to Section 23 06 15 for Airflow Measurement Devices.

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. Blower – Coil Air Handling Unit

1.3 REFERENCE STANDARDS

A. Refer to Section 23 02 00 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 23 02 10 for a general description of requirements applying to this Section.

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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 23 02 00.

B. Submit shop drawings and descriptive date 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 BLOWER – COIL AIR HANDLING UNIT

A. General:

1. Install each unit as shown on the plans in accordance with: The Manufacturer's recommendations, and all applicable national and local codes.

2. UL approved.

3. Covered by a 1-year limited parts warranty on the complete unit.

4. In current production with published literature available to check performance, limitations, specifications, power requirements, dimensions, operation and appearance.

B. Unit Enclosure:

1. Exterior panels of 18-gauge steel that have been finished with baked enamel to provide a

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long-lasting, quality appearance. Casing shall be insulated with one inch (1”) 1-1/2 lb. density fiberglass, fire resistant and odorless material.

2. Removable panels to provide easy access to the internal components for maintenance and service.

3. A filter rack with 2" throwaway, pleated filters, 30% standard MERV 6 efficiency, flat or angled arrangement with end covers.

C. Fans shall be SWDI, forward-curved, centrifugal blower type equipped with heavy duty adjustable speed V-belt drive. The fan shaft shall be supported by heavy duty, permanently sealed ball bearings. Fans shall be dynamically balanced.

D. Blower Motor shall:

1. Be 1750 RPM, open dripproof.

2. Have inherent protection, permanently lubricated ball bearings and a service factor of at least 1.15.

3. Be factory mounted within the insulated cabinet and wired to a junction box, factory set to scheduled voltage.

E. V-Belt Drive shall:

1. Be rated at least 25% above the required HP.

2. Permit the blower RPM to be adjusted to meet the exact CFM requirement of the system.

F. Evaporator Coil:

1. Shall consist of copper tubes arranged in staggered rows and mechanically expanded into aluminum fins.

2. Shall be positioned for draw-thru operation.

3. Include a factory mounted distributor and expansion valve.

4. Include sloped drain pan, plastic or mastic coated steel, fully drainable, main and auxiliary connections of ¾” PVC or threaded pipe.

G. Mixing Box:

1. Section constructed of heavy gauge galvanized steel, treated similar to unit cabinet.

2. Provide two low leak parallel blade dampers factory linked with drive rod extended to accommodate motor actuator external to the section. Return air damper shall be parallel blade, outside air damper shall be opposed blade.

3. Damper blades shall be extruded aluminum with interlocked edge seals and frame seals.

4. Dampers shall be suitable for temperature range of -50 to 230ºF.

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5. Section shall include two, side access panels.

H. Accessories:

1. Factory mounted and wired disconnect switch, and 24 VAC control transformer (50va.)

2. Factory mount/wire the DDC controller and discharge air sensor furnished by the BAS as part of the work of Section 230900.

K. Condensing Unit: Manufacturer's Standard per Section 230450.

L. Manufacturers: Carrier, International Environmental Corp., Daikin McQuay, Temtrol, Trane, York/JCI.

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 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.

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I. Provide certified factory start-up and written report on all units.

END OF SECTION

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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 Architect/Engineer/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 Architect/Engineer/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.

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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 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 Architect/Engineer/Construction Manager at least three working days in advance of test and conduct in presence of Architect/Engineer/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

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E. The balancing firm shall report to and review the work required with the Architect/Engineer 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 Architect/Engineer/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 DRAINAGE AND CONDENSATE SYSTEMS TESTING (INCLUDING EXTERIOR PIPING)

A. Disconnect all equipment and devices which may be damaged by test pressures.

B. Plug or cap lines.

C. Test each piping system for leaks in accordance with local inspection test code.

D. Repair all leaks noted.

E. Minimum test shall be to fill system to top vent stack and roof drain, and not show a drop of more than 3 inches for 1 hour. Test shall be performed before piping is concealed.

F. Secure certificate from Municipal Inspector of acceptable test.

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

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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. 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

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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. Electrical service
3. Interior feeders
4. Lighting and power panels
5. Lighting branch wiring
6. Power wiring
7. Lighting fixtures and lamps
8. Wiring devices
9. Connections for electrically operated equipment
10. Fire alarm and detection system
11. Telephone raceway system
12. Lightning protection system
13. 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

1.4 SITE CONDITIONS

A. Attention of all bidders is called to the necessity for a careful inspection of the site, its present

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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:

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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

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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.

1.3 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

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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.

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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. Training

1. Electrical Contractor shall be responsible for coordination of Owner training. Factory employed technician(s) shall provide training, including demonstration and education on the system capabilities, operation and maintenance. Training sessions shall be minimum 4 hours (maximum 8 hours), and shall be provided for each shift of workers. Scheduled training shall be coordinated at least two 92) weeks in advance with the Owner and the Commissioning Agent.

2. Video Documentation: Furnish three (3) copies of a professionally taped video and three (3) copies of professionally prepared drawings demonstrating the following:

- Emergency Generator System
- Security System
- Fire Alarm System
- Integrated Access Control
- Clock System
- VFD’s
- MDF/IDF

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

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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.

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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 CONCRETE

A. Concrete shall be in accordance with Section 03300, or ACI-613. Designer choice if 03300 is not used.

B. The 28-day minimum compressive strength shall be 3000 psi.

2.3 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.

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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.

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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 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 slides. Excavated material shall not be piled where it will interfere with traffic.

B. No conduits 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 a 3/4" mesh sieve. Not less than 30% shall be fine which will pass through a 3/8" mesh sieve.

C. Where excavation is required through tree root areas, roots shall be saw cut, treated with pruning paint and covered with burlap. Burlap shall be wet and shall be protected and maintained in a moist condition during entire period of exposure. Backfill shall be carefully placed and hand-tamped to a minimum of 6" above roots.

D. Bidder shall base his estimate upon the presumption that all excavation required in the performance of this Contract will be earth. If rock is encountered, Contractor will be reimbursed for the additional work required to remove same based upon the unit cost established in the proposal.

E. All detached boulders or loose stone not exceeding 1 cubic yard, all topsoil, sand, gravel, clay, rubbish, walls or other subgrade construction, and all other materials of every name and nature which can be removed without breaking up with pneumatic breakers or explosives shall be considered earth excavation.

F. All rocks, attached boulders, boulders exceeding 1 cubic yard, walls or other subgrade construction and materials which cannot be removed without breaking up with pneumatic equipment or explosives shall be considered rock excavation.

G. Before commencing any rock excavation for which extra compensation is to be paid, a rock contour drawing shall be prepared by the Contractor and checked by the Architect. The width shall be based on 2'-0". This rock contour drawing and width allowance will be used to compute the quantity of rock for which the Contractor will be reimbursed at the unit price established.

NOT FOR BIDDING PURPOSES

3.11 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.

3.12 BACKFILLING

A. After work in trenches has been completed, they shall be filled with good, clean, fine earth 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 conduit. 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 clean 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 conduits, necessary conduit protection shall be applied.

3.13 FOUNDATIONS FOR EQUIPMENT/HOUSEKEEPING PADS

A. Provide all foundations for equipment installed under this specification Division and/or as indicated on plans.

B. Construct concrete foundations on structural floor slabs or on grade in the manner or as required by the approved shop drawing details of the manufacturer or the utility company.

C. Provide and install concrete.

NOT FOR BIDDING PURPOSES

D. Metal reinforcement shall be deformed steel bars or cold drawn steel wire, or fabricated forms of these materials as required.

E. Furnish anchors of size and number noted, with bottom plates and sleeves.

F. Forms shall conform to the shape, lines, grades, and dimensions of the concrete, required by the approved shop drawing details of the equipment manufacturers, or approved on the Contractor's Equipment room layouts. They shall be sufficiently tight to prevent leakage of mortar and shall be braced or tied together to maintain position and shape. Forms shall be moved in such manner as to insure the complete safety of the structure.

G. All exposed corners or edges shall be chamfered. All burrs, fins, irregularities of forming or spillage shall be removed and the surface float or trowel finished to a smooth, straight surface.

H. Housekeeping Pads: Provide 4" thick, and size as required by approved shop drawings, concrete pad for all equipment installed on floor. Pad shall be steel reinforced with all edges and surfaces finished as described above. When installing over existing concrete, surface of existing pad shall be prepped using a bushing tool to rough in entire surface. Whether pouring over new or existing concrete, provide U-shaped rebar anchors set in epoxy to secure pad to pad.

3.14 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.

3.15 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.

3.16 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".

NOT FOR BIDDING PURPOSES

3.17 EQUIPMENT CONNECTIONS

A. Provide required wiring, raceways and final connections for all equipment provided by this Division and Divisions 1 thru 23.

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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.

3.18 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.

3.19 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

NOT FOR BIDDING PURPOSES

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.

NOT FOR BIDDING PURPOSES

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.

NOT FOR BIDDING PURPOSES

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

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..
4. Power transfer equipment.
5. Fire Alarm Master Station and Annunciator.
6. Security Control Panels and Annunciator.

NOT FOR BIDDING PURPOSES

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

NOT FOR BIDDING PURPOSES

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 26 00 00 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.
Polyvinyl chloride conduit (Exterior Underground Only)
Flexible metal conduit.
Liquid-tight flexible metal conduit.
Surface raceway.
Multi-Cell Raceway
Wireways.

1.3 REFERENCE STANDARDS

A. Refer to Section 26 00 00 for a general description of requirements applying to this Section.

1.4 QUALITY ASSURANCE

A. Refer to Section 26 00 00 for a general description of requirements applying to this Section.

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.

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.

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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.

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D. Polyvinyl Chloride Conduit:

1. Raceway: Heavy wall, rigid non-metallic, schedule 40 with bell type end, designed for above ground exposed applications, direct earth burial, and concrete encasement.

2. Fittings: Polyvinyl chloride, heavy duty, glue type, designed for Schedule 40 application.

3. Subject to compliance with requirements, provide products of one of the following:
   Allied Tube & Conduit
   Carlon
   Queen City Plastics, Inc.
   Scepter Electric Systems

E. 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

F. 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 oil-tight, 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

G. Multi-Cell Raceway

1. Raceways: Shall be a multi-cell raceway system for concrete encasement applications, 20 ft. lay length sections of 4” PVC outer shell type C with four (4) 1-1/4” nominal pre-lubed PVC innerducts pre-installed. The innerducts shall be color coded (white/grey/orange/green). Raceway shall be similar to Carlon Telecom System Part No. MXSS4S-020.

2. Fittings: Raceway shall be provided with a complete line of, but shall not necessarily be limited to, couplings, offsets, 90 deg., 36” radius bends, adapters, hold-down clips, end-caps and other accessories as needed for a complete system.

3. Interior Use Only:

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a. Raceways: Shall be multi-cell raceway system for use inside building applications. 10 ft. length sections of 4” electrical metallic tubing with four (4) 1-1/4” nominal pre-lubed PVC innerducts pre-installed. The innerducts shall be color-coded (white/grey/orange/green). Raceway shall be similar to Carlon Telecom System Part No. MESS4S-010.

b. Fittings: Raceway shall be provided with a complete line of, but shall not necessarily be limited to, couplings, offsets, 90 deg., 36” radius bends, adapters, hold-down clips, end-caps and other accessories as needed for a complete system.

4. Subject to compliance with requirements, provide products of the following:

Carlon Electrical Products.

H. Surface Raceway:

1. Dual Service Raceway: Two-piece wireway, base to be .054" galvanized steel, cover to be .040" galvanized steel. Complete unit shall have a cross sectional area of 7.2 square inches. Finish shall be color as selected by Architect. Wireway to be similar to Wiremold Series 4000, Cat #V4000B and V4000C.

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:

Wiremold Co.
Walker, Butler Manufacturing Co.
Hubbell

I. 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

J. 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.

NOT FOR BIDDING PURPOSES

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 26 00 00 for excavation, shoring and pumping, concrete and backfilling requirements.

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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

NOT FOR BIDDING PURPOSES

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. Arrange for and coordinate with the Utility Company and pay any and all costs in conjunction with the 25KV primary service from the point of connection to 25KV pad-mounted transformer.

C. Types of wire, cable and connectors in this section include, but not limited to the following:

Copper conductors.
Tap type connectors.
Split-bolt connectors.

D. Refer to other sections of Division 26 for, but not limited to, raceways, connections used in conjunction with wire and cable work.

E. Applications for wire, cable and connectors required for project are as follows unless otherwise indicated:

1. Primary Service Circuitry.
2. Power Distribution Circuitry.
3. Appliance and Equipment Circuitry.
4. Motor Branch Circuitry.
5. Control Circuitry.
6. Signal Communication Circuitry.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. <u>Wire and Cable</u>

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.

NOT FOR BIDDING PURPOSES

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.

NOT FOR BIDDING PURPOSES

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

D. 25KV Cable: Provide factory fabricated and tested primary service cable; underground residential distribution (URD) type cable, size #1/0 AWG solid aluminum conductor with 25KV cross-linked polyethylene insulation (XLP) with tinned or coated copper wire full size concentric neutral as approved by the Utility Company.

E. 25KV Terminations: Provide 25KV terminations for 25KV #1/0 AWG solid aluminum cable as approved by the Utility Company in quantities required by the Utility Company.

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.

C. Installation of 25KV primary service cable with the Utility Company.

D. Deliver 25KV cable terminations to the Utility Company for installation and connection.

NOT FOR BIDDING PURPOSES

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.

C. Test 25KV cable after installation using D.C. high potential (Hi-Pot) testing. All testing shall be performed in accordance with cable manufacturer's recommended specifications. Keep a complete record of all tests and submit to the Engineer upon completion. Testing shall be performed by an independent cable testing company or service.

END OF SECTION

NOT FOR BIDDING PURPOSES

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

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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.

C. Refer to Section 260140 – WIRING DEVICES for exterior receptacle outlet boxes.

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.

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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

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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.
Surface Receptacle Strip
Lamp dimmers
Contactors
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
Tork
Grasslin
Paragon
Wattstopper

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

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complying with NEC and NEMA Standards for wiring devices. Color selection to be verified by Contractor with Architect/Engineer.

2.3 RECEPTACLES

A. All simplex receptacles shall be extra heavy duty, 20 amperes, 125 volts, 2 pole, 3 wire grounding, with green hexagonal equipment ground screw, with metal plaster ears, side wiring, NEMA configuration 5-20R unless otherwise indicated. Hubbell Cat. #HBL5361, or approved substitute.

B. All duplex receptacles shall be extra heavy duty, 20 amperes, 125 volts, 2 pole, 3 wire grounding type with green hexagonal equipment ground screw, with metal plaster ears, side wiring, NEMA configuration 5-20R unless otherwise indicated. Hubbell Cat. #HBL5362, or approved substitute.

C. Special Purpose Receptacles: Provide polarized grounding type special purpose receptacles of the required amperage and voltage ratings, extra heavy duty. Device shall include a green hexagonal equipment ground screw.

D. All ground fault receptacles shall be extra heavy duty duplex, tamper resistant, 20 amperes, 125 volts, 2 pole, 3 wire grounding type with green hexagonal equipment ground screw, integral ground fault circuit interrupter, UL rated Class A, Group 1, with metal plaster ears, side wiring, NEMA Configuration 5-20R, self-testing with red and green LED indicator lights. Device shall include solid state ground-fault sensing and signaling, with a 5 milliampere ground fault trip level, plus or minus 1 milliampere. Hubbell Cat. #GFR5362SG, or approved substitute.

1. Whether indicated or not on the floor plans, the Electrical Contractor shall furnish and install GFI protected devices in kitchen areas on countertops near sinks, water coolers, refrigerators, 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. Receptacles protected by GFI circuit breakers shall be permanently labeled on the faceplate as GFCI.

2.4 USB CHARGING DEVICES

A. All USB charging devices shall be heavy duty, 5VDC, 4.2A charging capacity, 3-wire grounding, with green hexagonal equipment ground screw, with metal plaster ears, quadruple charging outlet ports, Hubbell Cat. #USB4, or approved substitute.

B. All USB charging devices with receptacles shall be extra heavy duty, 20 amperes, 125 volts, 2 pole, 3 wire grounding, with green hexagonal equipment ground screw, with metal plaster ears, side wiring, NEMA configuration 5-20R, with teo charging outlet ports, 5VDC, 3.8 amp charging capacity, Hubbell Cat. #USB20X2, or approved substitute.

2.5 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 earls, and side wired screw terminals. Similar to Hubbell Series HBL Series or approved substitute.

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2.6 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. Boxes and devices shall be recessed, weatherproof with smoke gray opaque in-use covers. Intermatic Cat.#WP1000(H)GRC.

C. Existing mechanical spaces where concealed work is impractical, such as masonry pr block walls, provide 4" square boxes, surface mounted, with ½" deep surface mounted device plates consisting of same material for devices indicated on plans, whether single or double gang. Use of plaster flange and standard cover plate will not be acceptable.

2.7 SURFACE RECEPTACLE STRIP (4000 Wiremold only)

A. Refer to Specifications Section 260110 – RACEWAYS for surface raceway specifications.

B. Power, telephone and data outlets with device plates shall match devices used elsewhere in the project. Where power and telephone, power and data, or power, telephone and data are indicated on the Floor Plan, the strip shall be divided into two (2) sections "Power" and "Communications". Communications and power wiring shall be as indicated in contract documents on the floor plans.

C. Length of receptacle strip and the centers on which the device outlets are mounted shall be as indicated in contract documents. The strip shall be complete with all required hardware needed to provide the layout indicated on the floor plan.

D. Drops shall be installed in order to minimize vertical runs and obstructions, unless noted otherwise on drawings.

2.8 CONTACTORS

A. Electrically Held Power Lighting Contactor: Shall be rated 30 to 200 AMPs for 2 thru 5-pole versions and 300 to 800 AMPs for 2 and 3 pole versions, as indicated on the Floor Plan. Contactor shall have factory wired control and clearly marked termination points, designed for mixed load ratings with a UL listed short-circuit rating up to 100,000 amperes. Contactor shall be housed in a NEMA Type I, general purpose enclosure and be similar to Square D Company, Type "S", Class 8903 or approved substitute.

B. Mechanically Held Power Lighting Contactor: Shall be rated 30 to 200 AMPs for 2 thru 5 pole versions and 300 to 800 AMPs for 2 and 3 pole versions, as indicated on the Floor Plan. Contactor shall have factory wired control with coil clearing contacts and clearly marked termination points, designed for mixed load ratings with a UL listed short-circuit rating up to 100,000 amperes. Contactor

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shall be housed in a NEMA Type I, general purpose enclosure and be similar to Square D Company, Type "S", Class 8903 or approved substitute.

C. Multiple Lighting Contactor: Shall be an electrically or Mechanically held device with 2 thru 12 poles rated 30 AMPs ballast and 20 AMPs tungsten, as indicated. Mechanically held contactor shall have factory wired control with coil clearing contacts and clearly marked termination points. Contactor shall be housed in a NEMA Type I, general purpose enclosure and be similar to Square D Company Types "L" and "LX", Class 8903 or approved substitute.

D. General: All contactor control setups shall include all required interface relays needed to function with maintained or momentary contact switches, time clocks and photocell controls. Control circuits and coil voltages shall be 120 volts A.C. single phase. Where system voltage is 277/480 volts, a control power transformer shall be furnished and installed within the contactor enclosure. Transformer shall be sized to handle the contactor's coil load as well as all associated control devices.

2.9 ENERGY CONTROL DEVICES (Occupancy Sensors)

A. Line Voltage:

1. Combination wall switch and sensor shall be Dual Technology Passive Infrared and Ultrasonic, designed for single gang outlet box installation, with a coverage of 180° for a maximum of 400 square feet. Device shall be suitable for 120/277 dual voltage operation, and have vandal resistant, hard sensor lens. Device shall be similar to Sensor Switch Cat. No. WSD-PDT or Wattstopper DW-100 Series, DW-103 Series for multi-way, DW-200 for dual relay, DW-203 for multi-way dual relay, or approved substitute.

2. Ceiling sensor shall be Dual Technology Passive Infrared and Ultrasonic 360° coverage, 1200 square feet maximum. Self Contained Relay Device shall be suitable for 120/277 Dual Voltage operation. Device shall be similar to Sensor Switch Cat. No. CMR-PDT, Wattstopper DT-355 or approved substitute.

B. Low Voltage:

1. Ceiling mounted sensor shall be Dual Technology Passive Infrared and Ultrasonic with 360° coverage up to 30 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.

C. Photocontrol

1. Provide epoxy conformal coated cadmium sulphide photocell with Lexan impact and vandal resistant enclosure. Dome and base to be ultrasonically welded. Photocell shall respond to the light spectrum near to that of a human eye. Housing shall mount to ½" conduit and have 180° swivel.

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2. Photocell shall have on/off time delay, on at 1 to 5 FC, off at 3 to 15 FC. Tool free adjustment. Unit shall fail in the ON position.

3. Unit shall operate from -40°F to 140°F, with a minimum 5-year warranty.

4. Provide Tork 2001 series or approved equivalent.

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 AND COMMISSIONING

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.

C. All areas where energy control devices are specified shall be verified for full coverage and accurate operation. If any area is determined by the Owner, Architect, or Engineer to have inadequate coverage or operation, Contractor shall provide additional energy control devices to remedy the coverage or operation issue. For bidding purposed, own 5 extra devices fully installed. After successful

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commissioning, uninstalled devices shall be handed over to the Owner for spare devices. Device types shall be as required for commissioning, or as selected by Owner for space devices as applicable.

END OF SECTION

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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 schematic 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.

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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 starter 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

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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

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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)

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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.

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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.

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. Directories shall indicate room numbers as indicated on contract documents and room numbers as physically labeled in the field.

E. The Electrical Contractor shall provide directories compiled using a software program that is Windows compatible. Program shall handle multiple panels, calculate panel electrical loads from user supplied data, maintain a history of repairs and upgrades by circuit, and be capable of printing panel directories and summaries. Verify compatibility with Owner's operating system.

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F. Provide two discs to owner containing software and project panel directories and summaries.

END OF SECTION

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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)
Square D Company
Siemens

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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

NOT FOR BIDDING PURPOSES

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. Service entrance rated disconnect.
2. 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)
   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. Service Entrance Rated Disconnect: The service disconnect device shall be a molded-case circuit breaker totally front accessible and front connectable. The circuit breaker shall be a three-pole device suitable for operation on a 208 volt, 60 Hertz system. Circuit breaker shall have

NOT FOR BIDDING PURPOSES

22,000 RMS symmetrical amperes interrupting rating, and shall be UL approved for Service Entrance equipment.

C. Molded-Case Circuit Breakers: Provide factory assembled, molded-cased circuit breakers of frame size indicated; 120/208 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 over center, 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

NOT FOR BIDDING PURPOSES

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.

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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)
Hilti, Inc.

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.
Hilti, Inc.

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

NOT FOR BIDDING PURPOSES

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.

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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

NOT FOR BIDDING PURPOSES

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)
PVC (Below Slab Only)
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

NOT FOR BIDDING PURPOSES

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

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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.

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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.

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

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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. 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. Each lighting fixture type specified represents a specific style and quality of fixture acceptable for this project.

B. 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.

C. 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 bid using non- listed fixtures for the listed Lighting Representatives. The Engineer and the Architect shall make the final decision on whether the submitted fixture meets the project's requirements during shop drawing review.

D. Should the Contractor be unable to obtain approval of the resubmitted manufacturer, then he should submit the basis of design specified manufacturer/fixture.

NOT FOR BIDDING PURPOSES

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. LED Drivers

1. All LED fixtures shall be provided with integral drivers (unless noted otherwise) and must operate at line voltage as indicated on drawings (unless noted otherwise).

2. LED drivers shall have operating temperature of 50°F - 140°F unless noted otherwise.

3. LED drivers shall carry a 5-year warranty.

C. 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' 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' 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' 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.

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D. 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.

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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

NOT FOR BIDDING PURPOSES

SECTION 26 05 20

ROADWAY & PARKING AREA LIGHTING

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of roadway and parking area lighting work is indicated by drawings and schedules.

B. Applications of roadway and parking area lighting in this section include the following:

Private roadways.
Automobile parking lots.
Pedestrian walkways.
Building entrances.

C. Excavation and backfilling for roadway and parking area lighting poles, standards and foundations are specified in applicable Division 26 General Provisions sections.

D. Concrete for embedding poles, and for pole foundations and footings are specified in applicable Division 26 General Provision sections.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's data on roadway and parking area lighting units, including certified dimension drawings of components including, but not necessarily limited to, fabricated poles and standards, and hardware.

PART 2 – PRODUCTS

2.1 GENERAL

A. Provide concrete bases, standards and luminaries of sizes, types and ratings indicated; complete with but not necessarily limited to anchor bolts, housings, lamps, lampholders, reflectors, ballasts, starters, lighting brackets and wiring; wired and connected in place, tested and left in satisfactory operating condition. See schedule on the drawings for types of standards and luminaries. Type letters are keyed with fixture letters indicated at the outlets on the drawings.

B. Material: Extruded aluminum.

C. Configuration: Anchor base type with handhole and cover where indicated.

D. Metal Lighting Standard Accessories: Provide accessories for metal lighting standards, including anchor bolts, as recommended by standard manufacturer of sizes and materials needed to fulfill loading and erection application requirements.

E. Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type of roadway and parking area lighting unit): As specified under "PRODUCTS".

NOT FOR BIDDING PURPOSES

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install roadway and parking area lighting units as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC, NESC and NEMA standards, and with recognized industry practices to ensure that lighting units fulfill requirements.

B. Use belt slings or rope (not chain or cable) to raise and set finished poles and standards to protect finishes.

C. Set poles and standards plumb. Support adequately during backfilling, or anchoring to foundations.

3.2 ADJUST AND CLEAN

A. Clean standards and luminaries of dirt and debris upon completion of installation.

B. Protect standards and luminaries from damage during remainder of construction period.

3.3 FIELD QUALITY CONTROL

A. Upon completion of installation of roadway and parking area lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at 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 testing, as judged by Architect/Engineer.

3.4 GROUNDING

A. Provide tight equipment grounding connections for each lighting fixture installation.

END OF SECTION

NOT FOR BIDDING PURPOSES

SECTION 28 07 21

FIRE ALARM AND DETECTION SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. It is the intent of these drawings, schedules and specifications to outline the scope of work required to furnish and install a complete and operating fire alarm and detection system for this project.

B. The following specifications and the associated drawings are for reference only and are to only indicate the intent for a required fire alarm system and the level of quality. These specifications and drawings shall not be used for the basis of providing a bid for the project. It will be the responsibility of the Electrical Contractor to obtain the services of a licensed fire alarm vendor in the State of Delaware to indicate the required items necessary for a complete and operational system as recognized by the NFPA, State Fire Marshal's Office and the ADA. This responsibility shall also include any coordination with fire protection interface, mechanical equipment shutdown, etc. During construction, the shop drawings shall be submitted and approved by the Authority Having Jurisdiction (AHJ). Any changes required by the AHJ during the shop drawing review or during the final walk-thru shall be the responsibility of the Electrical Contractor and shall not be passed on to the Owner, Architect or Engineer in the form of a change order.

C. Types of fire alarm and detection systems required in this section include the following:

Combination:	Manual and Automatic
Zoned:	Wing, Floor, Level, Area, Machine or Device
Non-Coded:	Continuous Signal

D. The system shall include all required hardware, raceways, interconnecting wiring and software to accomplish the intent of this specification and the contract drawings, whether or not specifically itemized herein.

E. All equipment furnished and installed shall be new and the latest state of the art products of a single manufacturer engaged in the manufacturing and sale of the specified fire detection devices for over ten (10) years.

F. The system as specified shall be furnished, installed, tested and approved by the local Authority Having Jurisdiction, and shall be turned over to the owner in an operational condition. In the interest of job coordination and responsibility the installing contractor shall contract with a single supplier for fire alarm equipment, engineering, programming, inspection and tests, and shall be capable of providing a “UL Listing Certificate” for the complete system.

G. Demolition of existing fire alarm system, once the new system is installed, functioning and certified. Furnish temporary interface between the old existing system and the new fire alarm system, as both will exist side by side, during completion of the project. The Electrical Contractor shall not allow both the new and existing system manual pull stations to exist side by side and, therefore, confuse building personnel.

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H. Coordinate with Mechanical Contractor to furnish operations for air handling unit shutdown.

1.2 QUALIFICATIONS OF INSTALLERS

A. Before commencing work, submit data showing that the manufacturer has successfully installed fire alarm systems of the size, scope, type and design in projects of this type.

B. The manufacturer's vendor and his fire protection engineer shall have a minimum of five (5) years experience in, and be licensed and certified in, the design and installation of the selected fire alarm system being furnished for this project.

C. The installing contractor shall submit copies of all required Licenses and Bonds for his selected equipment vender, his fire protection engineer and his own as may be required by the City, County and State of Delaware.

D. The selected vendor shall be qualified by "UL" for certifying fire alarm systems. Upon completion of the installation the vendor shall certify the final system meets "UL" ongoing maintenance.

1.3 MANUFACTURER'S REPRESENTATIVE

A. The electrical contractor shall furnish the services of a manufacturer factory trained and certified representative, experienced in the installation, operation, maintenance and service of the type of system being furnished. The representative shall be licensed in the State of Delaware. The representative shall supervise the installation, software documentation, adjustment, preliminary testing, final testing and certification of the system. The representative shall furnish the required instruction to the owner's personnel in the system's programming, operation and maintenance.

1.4 CODES, REGULATIONS AND STANDARDS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only. The latest version of each listed publication shall be used as a guide unless the authority having jurisdiction has adopted an earlier version.

B. Factory Mutual (FM)

1. FM AG Approval Guide

C. National Fire Protection Association (NFPA)

1. NFPA 70 National Electrical Code (NEC)
2. NFPA 72 National Fire Alarm Code
3. NFPA 90A Standard for the Installation of Air Conditioning and Ventilating Systems
4. NFPA 101 Life Safety Code
5. NFPA 170 Standard Fire Safety and Hazmat Symbols

D. Underwriters' Laboratories, Inc. (UL) Appropriate "UL" equipment standards

1. "UL" 864 Control Panels

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2. "UL" 268 Smoke Detectors
3. "UL" 268A Smoke Detectors (HVAC)
4. "UL" 1076 Security
5. "UL" 1971 Standard for Visual Signaling Appliances

E. Building Codes

1. BOCA National Building Code and the BOCA Fire Code
2. Standard Building Code and the Standard Fire Code
3. Uniform Building Code and the Uniform Fire Code
4. International Building Code and the International Fire Code

F. State Codes and Regulations

1. Delaware State Fire Prevention Commission
2. State of Delaware
3. State Fire Prevention Regulations as amended through January 1995
4. Americans with Disabilities Act of 1990 and/or State and Local equivalency standards adopted by The Authority Having Jurisdiction.

1.5 COORDINATION

A. As a requirement of this project, the Electrical Contractor and/or his subcontractor or vendor shall furnish coordination for his equipment and layouts with other subcontractors or vendors furnishing equipment and services for Divisions 1 thru 23. Any and all contractors who install their equipment or furnish services prior to coordination, or 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.

B. The Mechanical, Plumbing, Fire Protection and Electrical Contractors are responsible to coordinate all manufacturer's recommended sizes for all circuit breakers, starters, disconnects, fuses, wire and conduit 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 different 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.

1.6 SUBMITTALS

A. The installing contractor shall include the following information in his shop drawing equipment submittal:

1. Submit manufacturer's data on fire alarm and detection systems including, but not limited to, roughing-in diagrams and instructions for installation, operation and maintenance, suitable for inclusion in maintenance manuals. Also include a standard of a typical riser diagram and wiring diagram for equipment to be furnished and installed under this contract.

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2. The fire alarm devices and equipment shown on the floor plans is indicated strictly to show intent and coordination with other trades, and shall not be taken to indicate a complete fire alarm and detection layout; meeting all NFPA, State and local codes for this project. It shall be the responsibility of the Electrical Contractor's sub-contractor/vendor and his fire protection engineer to produce a complete set of drawings indicating all required equipment, devices, wiring diagrams and components needed to meet and fulfill the requirements of the NFPA, State of Delaware's Office of the Fire Marshal and the Authority Having Jurisdiction.

3. One (1) complete set of the entire submittal shall be forwarded to the local Fire Marshal's Office for approval. The submission shall also include the following:

   a. Power calculations. Battery capacity calculations. Battery size shall be a minimum of 125 % of the calculated requirement.
   b. Supervisory power requirements for all equipment.
   c. Alarm power requirements for all equipment.
   d. Power supply justification showing power requirements for each of the system power supplies. Power supplies shall be sized to furnish the total connected load in a worst-case condition plus 25 % spare capacity.
   e. Voltage drop calculations for wiring runs demonstrating worst-case condition.
   f. NAC circuit design shall incorporate a 15% spare capacity for future expansion.

   The plan review by the Fire Marshal's Office shall be forwarded to the Project's Engineer, signed or under cover sheet, of approval from the Fire Marshal, as a shop drawing, once received in triplicate.

4. Complete manufacturer's catalog data including supervisory power usage, alarm power usage, physical dimensions, finish and mounting requirements.

5. Complete drawings covering the following shall be submitted by the Electrical Contractor for the proposed system:

   a. Floor plans in a CAD compatible format showing all equipment and raceways, marked for size, conductor count with type and size, showing the percentage of allowable National Electrical Code fill used.

   b. Furnish a fire alarm system matrix as referenced by NFPA 72 figure A-7.5.2.2 (1999). Matrix shall illustrate alarm input/output events in association with initiation devices. Matrix summary shall include system supervisory and trouble output functions.

   c. Include any and all departures, exceptions, variances or substitutions from these specifications and/or drawings at the time of bid.

6. Should the above-mentioned information not be included in the shop drawing submission, the submission shall be rejected without processing and returned to the contractor.

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PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The model numbers provided are for use with the Notifier NFS – 640 fire alarm system and outline the products to be furnished for this project.

B. Approved equipment manufacturers and installing vendors:

1. Notifier
2. Simplex.
3. Edwards System Technology
4. Gamewell
5. Silent Knight
6. Siemens
7. Bosch-Radionics

C. Approved equipment manufacturers listed must be installed by an authorized distributor certified by the manufacturer for the sales, service, installation, and maintenance of the system.

D. These specifications are designed and written in such a manner as to represent the minimum Fire Alarm and Detection System requirements. Any other components not indicated in these specifications, but deemed necessary by the selected manufacturer, for a complete and operational system, shall be included at no additional cost to the owner.

E. Once the vendor's design has been through the Fire Marshal's Office, and received his approval and been submitted as shop drawings, any additional devices required by the Fire Marshal shall be taken from the spare equipment list. Refer to paragraph 5.3 SPARE EQUIPMENT herein.

2.2 GENERAL SYSTEM OPERATION

A. When an alarm occurs on an initiating device, the control panel indicates the alarm condition until manually reset.

B. An alarm may be acknowledged by actuating the "ACKNOWLEDGE" switch. This shall silence the panel buzzer and change the "SYSTEM ALARM" LED from flashing to steadily lit.

C. This project shall be provided with synchronized audible and visual signaling devices. Activation of the signal silence switch at the fire alarm panel shall cause the audible signal to stop. The visual signal shall continue. If a subsequent initiating device causes an alarm, the audible signal shall resound. The visual signals shall continue until the system is reset. Synchronization shall be provided so that horns and strobes on different circuits will operate in unison.

D. If the microprocessor fails, the system shall execute a default signaling program. This program will enable the panel to sound the audible signals and summon the Fire Department. Inability of the system to sound signals or summon the fire department during microprocessor failure shall not be acceptable.

E. A single ground or open on the system signaling line circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm from all initiating devices. A wire to wire

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short on the signaling line circuit shall cause fault isolation modules on either side to open allowing operation of all analog/addressable devices not located between the activated fault isolation modules.

2.3 SPECIFIC OPERATIONS

A. Operation of a manual station or automatic activation of any smoke detector, heat detector, or kitchen hood suppression system, shall cause the following:

1. Indicate on the Fire Alarm Control Panel and Annunciator Panels the specific device in alarm via the English-language alphanumeric display. The "ALARM" LED shall also flash and the local audible device shall pulse.

2. All strobes to flash in unison. All horns to sound a synchronized "Code 3" output. All speakers within the gymnasium, cafeteria, and auditorium to broadcast a "Code 3" pre-alert tone followed by a prerecorded voice message of the owner's choice.

3. Shutdown all air handling units in the vicinity of the alarm. Provide an addressable relay module at each air handling unit for connection to the low voltage shutdown control circuit. If a 120VAC control circuit is to be interrupted by the fire alarm system, provide an addressable control relay and isolation relay rated for the control circuit load.

4. Printing and history storage equipment shall log the information associated with each alarm condition, along with the time and date of each occurrence.

5. Release all electrically locked or held-open doors.

6. Transmit the fire alarm condition to a U.L. listed central monitoring station, to dispatch the local Fire Department.

B. Supervisory/Trouble Operations:

1. Alarm activation of a duct mounted smoke detector or sprinkler valve tamper switch, shall cause the exact device in alarm to be displayed on the fire alarm panel and remote annunciator alphanumeric display, and initiate a supervisory condition within the fire alarm panel.

2. Transmit a supervisory condition to the central monitoring facility.

3. Duct mounted smoke detectors, when in alarm, shall cause their associated air handling unit to shut down.

4. Activation of any trouble condition within the fire alarm system shall cause the trouble visual and audible indicators to operate within the fire alarm panel, the reason for the trouble condition to be shown in plain English on the alphanumeric display, and a trouble condition to be transmitted to the central monitoring facility.

C. The fire alarm system is to be connected to a U.L. listed central monitoring station, with the following requirements:

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1. The entire installation shall comply with the requirements of NFPA 72, 2002 Edition (Remote Station Protective Signaling System) utilizing a Digital Alarm Communicator Transmitter (DACT) and a Digital Alarm Communicator Receiver (DACR).

2. The fire alarm system shall transmit alarm, trouble, and supervisory conditions, a daily test signal and the other signals required by NFPA 72.

3. The contractor shall be responsible for the entire installation (wiring, mounting of system components, connections at panel and the Digital Alarm Communicator Transmitter, programming, and functional testing).

4. The contractor shall coordinate with the owner to provide off-site monitoring of the fire alarm system. Off-site monitoring shall be provided by the Owner's U.L. listed central station facility, and paid for by the Owner.

5. The owner shall be responsible for providing two (2) standard telephone lines at the rate demarcation point for connection to the fire alarm system dialer, and pay for all charges from the telephone company.

6. Digital alarm communicator transmitter shall be an integral component of the fire alarm control panel, and not a separate unit. Provide Notifier model UDACT Universal Digital Alarm Communicator Transmitter.

D. The fire alarm control panel shall be provided with a firefighter's one-way voice paging system.

1. The one-way voice paging system shall consist of a voice command center audio message generator with microphone and all-call pushbutton, pre-recorded voice message chip, speaker circuits with selector switches/status indicators, and audio amplifiers.

   Provide a minimum of (1) speaker circuit per area required to have voice evacuation signaling. Speaker circuits to be wired using a Style Y (Class B) circuit. Speaker circuits shall be provided with a maximum usage of 80% of it's rated maximum output, to allow for future additions. Provide calculations and supporting data in submittal booklet, for verification by review authorities. 25 watt audio amplifiers shall be provided so that no amplifier will exceed 80% of it's maximum capacity, to allow for future additions. Provide calculations and supporting data in submittal booklet, for verification by review authorities.

E. The fire alarm control panel shall be provided with strobe indicating circuits. Strobe circuits to be wired using a Style Y (Class B) circuit. Auxiliary power supplies and circuits shall be provided so that neither power supply or circuit will exceed 80% of its rated output, based on the strobe light intensities required by NFPA 72. Provide calculations and supporting data in submittal booklet, for verification by review authorities.

F. The fire alarm control panel shall be provided with a minimum of two (2) signaling line circuits, so that no one circuit exceeds 80% of its rated maximum. Provide calculations and supporting data in submittal booklet, for verification by review authorities.

   Signaling line circuits shall be wired using a Style 7 (Class A) circuit, incorporating fault isolation modules. Provide the required quantity of fault isolation modules so that no more than 20 analog/addressable devices are located between modules.

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G. The fire alarm control panel components shall be housed in multiple cabinets of the same dimensions. All components shall be integrally compatible with the main central processor, to provide a neat, and professional appearance. The use of separate central processors, strobe power supplies, or audio evacuation panels at the main fire alarm control panel location is forbidden. Remote audio/visual power supplies, as shown on the drawings, is acceptable. Care shall be taken during the system design phase so that both audible and visual signals located in the same viewing area will be synchronized.

H. The Fire Alarm Contractor shall provide required material and labor for the system to monitor the generator for generator running, generator fault and generator switch in non-automatic position.

PART 3 – SYSTEM COMPONENTS

A. The fire alarm control panel shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, printer, annunciators, and other system controlled devices.

1. The control panel shall provide for the connection of 396 intelligent/addressable devices, <u>without adding any additional components.</u> If more than 396 device count is required, provide additional central processor units as necessary to meet job requirements and spare capacities.

2. The central processor unit, in conjunction with the loop interface board, shall utilize the patented "Flash Scan" technology. This technology allows the fire alarm control panel to poll devices on the signaling line circuit in groups of 10, and "looks" for any state changes from each device. This provides faster response by the fire alarm panel to an "alarmed" device, instead of the traditional communications format where each device reports 100% of it's characteristics to the fire alarm panel each time it is polled. Activation of system outputs shall be performed within 2 seconds of an initiating device being placed in an alarm condition, on a fully loaded system. SYSTEMS that utilize the traditional device polling and those that cannot provide the system output response, as stated, are not acceptable.

3. The central processor unit shall provide the following features:

a. Individual microprocessor design with degrade mode operations
b. Cooperating multi-detector sensing algorithms that allow the fire alarm panel to interpret signals from adjacent detectors to make an alarm decision.
c. Fully field programmable
d. RS-232 output, standard
e. Alarm verification – provide 30 second verification of alarm condition for all analog sensors.
f. Drift compensation
g. Dirty detector and excessively dirty detector indications
h. Analog sensor sensitivity testing from the fire alarm panel, meeting requirements of NFPA72.
i. Dual walk test modes
j. Individual point or zone read, and point or zone enable/disable
k. Nine (9)sensitivity settings for analog smoke detectors

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4. Provide integral audio message generator with microphone and all-call button, pre-recorded voice message chip, speaker circuits with selector switches/status indicators, and audio amplifiers.

5. Provide integral strobe circuits with selector switches/status indicators, auxiliary 24VDC power supplies, and signal synchronization modules.

6. Provide integral digital alarm communicator transmitter.

7. Provide battery backup.

B. Display Interface Assembly

1. The display interface assembly shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.

2. The display interface assembly shall include status information and custom alphanumeric labels for all intelligent detectors, addressable modules and software zones.

3. The display shall provide a 640-character back-lit alphanumeric liquid crystal display (LCD). It shall also provide 10 light emitting diodes (LEDs), that will indicate the status of the following system parameters: AC POWER, FIRE ALARM, PRE-ALARM, SYSTEM TROUBLE, SUPERVISORY, SIGNAL SILENCED, CPU FAILURE, POINT DISABLED, SECURITY ALERT, AND OTHER EVENT.

4. The display shall provide a QWERTY keyboard with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Ten different password levels shall be available to allow customized levels of operator access to programming, point status and alter status menus. This shall be used by the owner to assign different levels of control and bypass capabilities to different employees based on their individual level of experience.

5. An intuitive user guidance program shall be standard, allowing personnel without any prior experience the ability to follow easy step-by-step instructions to access all information related to an alarm, supervisory, or trouble condition.

6. Five (5) dedicated pushbuttons shall be provided allowing simple “scroll by event” operations for particular active conditions in the system. One (1) button shall be provided to scroll only “Fire Alarm” conditions, one for “Security Alarms”, one for “Supervisory Alarms”, one for “Trouble Conditions”, and one for “Other Events”.

7. An interactive summary event counter shall be provided on the alphanumeric display to show the number of alarms, troubles, or supervisory conditions in the system.

8. The display shall include the following operator functions: SIGNAL SILENCE, RESET, DRILL AND ACKNOWLEDGE. In a network system, these commands shall be completed for the entire network.

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9. Fire alarm systems that cannot provide the high level of display and control functions, as outlined, are not acceptable.

10. For fire alarm systems that cannot provide the annunciation and control, as outlined, they must install a "Network Reporting Terminal" (not a CRT and keyboard) at the fire alarm panel location.

C. Secondary Power Source

A secondary power source consisting of lead acid batteries shall be provided. Batteries shall be of sufficient capacity to provide power for the entire system upon loss of normal 120VAC power for a period of twenty-four (24) hours, with five (5) minutes of alarm signaling at the end of this twenty-four (24) hour period. However, the batteries provided shall be able to meet the high alarm current required. Remote audio/visual power supplies shall be provided with (24) hours of supervisory operation and (5) minutes of alarm operation.

PART 4 – PERIPHERAL DEVICES

4.1 REMOTE ALPHANUMERIC ANNUNCIATOR

A. The unit to be provided shall be manufactured by Notifier. It shall be housed in a recessed mount backbox with smoked lexan window and key lock.

B. The remote alphanumeric annunciator shall provide an 80-character alphanumeric display, along with system control buttons.

C. Provide a color, CAD-generated map of the building plan with suitable frame at the fire alarm control panel and remote annunciator panel(s) locations.

4.2 ADDRESSABLE MONITOR MODULE - STYLE B

A. The addressable monitor module shall be a normally open (N.O.) contact type detection device which communicates with the main panel through the signaling line circuit. The unit shall contain a sub-loop that is wired Style B (Class B) and supplies an address for UL listed normally open contact devices on the sub-loop that close on alarm. When any open contact closes, the unit module address is transmitted to the main panel system and indicates on the 80 character alphanumeric display.

B. The address of the module shall be set by (2) rotary switches on the base of the unit. These switches utilize numbers 0 to 9. The use of jumper pins or any other means, except as stated above, shall not be acceptable.

C. The unit shall be mounted in the same enclosure as any normally open device that it monitors - if space permits - or it can be mounted in a standard 4-inch square or octagonal electrical box.

D. Use for connection to manual pull stations, remote power supplies, etc.

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4.3 ADDRESSABLE MONITOR MODULE - STYLE B/D

A. The addressable monitor module shall be a normally open (N.O.) contact type detection device which communicates with the main panel through the Addressable Monitor Module. The unit shall contain a sub-loop that is wired either Style B (Class B) or Style D (Class A) and supplies an address for UL listed normally open devices on the sub-loop that close on alarm. When any open contact closes, the module address is transmitted to the main panel and indicates on the 80 character alphanumeric display.

B. The address of the module shall be set by (2) rotary switches on the base of the unit. These switches utilize numbers 0 to 9. The use of the jumper pins or any other means, except as stated above, shall not be acceptable.

C. The unit shall be mounted in a standard 4-inch square X 2 1/8 inch deep square electrical box.

D. Use for connection to sprinkler waterflow/valve tamper switches, kitchen hood suppression panels, fire pumps, emergency generators, etc.

4.4 ADDRESSABLE OUTPUT MODULE

A. The Addressable Control Module shall energize upon alarm from any analog detector or monitor module or any combination of detectors and modules communicating with the NFS-640 control, or upon trouble from any analog detector or monitor module or any combination of detectors and modules communicating with the main panel control. A break in the wiring or removal of the module results in a fault message displaying on the panel, and the occurrence of a System Trouble. The module provides (2) sets of dry, form "C" relay contacts rated 2.0 Amp @ 30VDC (resistive). The module is used to supervise and control a Style Z or Style Y indicating appliance circuit when 24VDC is supplied to it from the Power Supply or Auxiliary Power Supply in the main panel.

B. The address of the modules shall be set by (2) rotary switches on the base of the unit. These switches utilize numbers 0 to 9. The use of jumper pins or any other means, except as stated above, shall not be acceptable.

C. The modules shall be mounted in a standard 4-inch square X 2 1/8 inch deep electrical box, with a 1 1/2 inch extension ring.

4.5 FAULT ISOLATOR MODULE

A. The module shall enable part of the signaling line circuit to continue operating when a short circuit occurs on it. A LED indicator shall blink in the normal condition and light during a short circuit condition. The module shall automatically restore the entire communications loop to the normal condition when the short circuit is removed.

4.6 MANUAL STATIONS

A. Manual stations shall be made of red phenolic resin plastic with "Fire" lettering, for semi-flush or surface mounting, and shall be of the double action design.

B. The station shall require two (2) distinct operations to actuate.

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C. Once activated, stations shall not be resettable without the use of a key and physically opening the station to reset.

D. The key shall be the same as that used to open the control panel.

E. Provide monitor module for connection to the fire alarm system signaling line circuit.

F. Provide protective guard with 9VDC integral sounder, Safety Technology International model STI 1100 (flush) or STI 1200 (surface), for each manual pull station.

4.7 AUTOMATIC INITIATING DEVICES

A. Analog Photoelectric Sensor

1. These detectors shall be of the photoelectric type, using a light scattering diode and photo sensor, and of the low-profile design. Maximum height of detector shall be 2 inches.

2. Detectors shall be designed for two-wire non-polarized installation and multiple listed with control units having specific voltage current characteristics which are compatible with the detector circuitry.

3. The detector shall have 360° angle orientation (circumference) smoke entry characteristics, permitting maximum response to both visible and invisible products of combustion from any direction. The detector shall be capable of operation at altitudes up to 7,500 feet without adjustments.

4. The sensors shall continually monitor to measure any change in their sensitivity due to the environment (dirt, smoke, temperature, humidity, etc.). They shall give an advance indication to the main control panel of the need for maintenance and can be specific as to where the maintenance is needed. If local regulations permit, then selected maintenance may be performed as opposed to having to check the sensitivity of all sensors to assure overall performance when only a few may be dirty.

5. The sensor shall be of plug-in construction and is directly interchangeable in the same base with the analog heat sensor. A wide variety of bases, with built-in horn, etc. are available.

6. Remote LED annunciator capability shall be available as an optional accessory.

7. The sensor shall feature fully coated circuit boards, special insect and dirt protection and superior RF/transient protection.

8. The unit may be tested from the control panel or functional testing can be performed by applying a test magnet according to the test procedures.

9. The address of the detector shall be set by (2) rotary switches on the base of the detector. These switches utilize numbers 0 to 9. The use of jumper pins or any other means, except as stated above, shall not be acceptable.

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10. The Analog Photoelectric Sensor shall be mounted to a standard 4-inch octagonal electrical box.

B. Duct Mounted Smoke Detector

1. The contractor shall furnish and install where shown on plans.

2. The duct housing contains an integral analog photoelectric type smoke detector. The exhaust sampling tube shall be molded into the base of the duct housing.

3. The address of the detector shall be set by (2) rotary switches on the base of the detector. These switches utilize numbers 0 to 9. The use of jumper pins or any other means, except as stated above, shall not be acceptable.

4. The detector shall be listed by Underwriters Laboratories, Inc. and approved by Factory Mutual under the current standards for photoelectric type duct smoke detectors - to allow remote functional testing without generating smoke.

5. Provide a remote test station for all duct mounted smoke detectors. Locate directly below unit in the suspended acoustic ceiling, or on wall at accessible location.

C. Analog Thermal Sensor

1. The series analog thermal sensors shall contain a state of the art electronic dual thermistor sensing circuit for fast response. These sensors provide open area protection with 50 foot spacing capability for rate of rise type and 25 feet spacing for fixed temperature type.

2. Two (2) LED's on each sensor light upon alarm and provide a local 360° visibility of alarm indication. The LEDS flash each time the unit is interrogated.

3. The sensor shall be of plug-in construction and is directly interchangeable in the same base with the intelligent photoelectric smoke sensor. The bases shall include a tamper-proof feature which, when activated, prevents removal of the sensor without the use of a tool.

4. The address of the detector shall be set by (2) rotary switches on the base of the detector. These switches utilize numbers 0 to 9. The use of jumper pins or any other means, except as stated above, shall not be acceptable.

5. The Analog Thermal Sensor shall be mounted to a standard 4-inch octagonal electrical box.

4.8 FIRE ALARM SIGNALING APPLIANCES

A. Audio/Visual Signaling Appliance (Horn/Strobe,)

1. The unit to be provided shall be manufactured by Notifier, with mounting as required, for ceiling mounting. Device color shall be red for wall-mounted applications, and white for ceiling mounted applications.

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2. It shall consist of an electronic horn with a UL1971/ADA Compliant Strobe. Strobe intensity to be provided as required by NFPA 72. Light intensities shown on drawings shall be used only as a basis for design. Field survey and adjust, if necessary, at no additional costs.

3. There shall be two dBA settings for the horn (low, high) that provide an alarm sound pressure level of 90, 98 dBA, respectively.

4. The horn/strobe shall interface with the Notifier Dual Synchronization Module to provide synchronized operation of the horn and strobe using (1) two conductor circuit.

5. The unit shall be semi-flush mounted, if possible.

6. If the unit is to be surface mounted, install the matching backbox skirt provided by the equipment manufacturer. The surface backbox shall be a finished product. Painted 4" square electrical boxes shall not be permitted.

7. Provide protective guard manufactured by Safety Technology International, where shown on plans.

B. Audio Signaling Appliance (Speaker-2 watt maximum)

1. The unit to be provided shall be manufactured by Notifier.

2. Speaker shall be comprised of a 4" voice cone with magnet, 25 watt audio transformer with ¼ / ½ / 1 / 2 watt taps, and a flush mount grille. Provide U.L. listed backbox skirt for a finished and professional appearance, where surface mounted. Provide 4" speaker support bracket for drop ceiling installations.

3. Unit to be white in color.

C. High Output Audio Signaling Appliance (Speaker - 15 watt maximum)

1. The unit to be provided shall be manufactured by Atlas Soundolier.

2. Speaker shall be of the re-entrant compression driver type, 4" square voice cone with magnet, 25-watt audio transformer with multi-tap configuration up to 15 watts, and a semi-flush housing. Provide U.L. listed backbox skirt for a finished and professional appearance, where surface mounted.

3. Unit to be red in color.

D. Audio Signaling Appliance (Trumpet Speaker)

1. The unit to be provided shall be manufactured by Wheelock.

2. Speaker shall consist of a high compression driver mounted to a cone shaped projector. Unit provided with an integral 25-watt audio transformer with multi-tap configuration up to 15 watts. Provided with an adjustable mounting base for exact directional positioning.

3. Mounts to a Wheelock surface mount backbox with adaptor plate. Unit to be red in color.

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E. Visual Signaling Appliance

1. The unit to be provided shall be Notifier with mounting as required, for ceiling mounting. Device color shall be red for wall mounted applications, and white for ceiling mounted applications.

2. Unit shall produce a 15, 30, 75, 95, or 110 candela light output according to the UL1971 Polar Light Distribution measurement. It shall also produce the same light output near center axis. Strobe intensity to be provided as required by NFPA 72. Light intensities shown on drawings shall be used only as a basis for design. Field survey and adjust, if necessary, at no additional costs.

3. The unit shall be semi-flush mounted, if possible.

4. If the unit is to be surface mounted, install the matching backbox provided by the equipment manufacturer. The surface backbox shall be a finished product. Painted 4" square electrical boxes shall not be permitted.

5. The strobe shall interface with the Dual Synchronization module to provide synchronized operation.

F. Audio/Visual Signaling Appliance (Speaker/Strobe)

1. The unit to be provided shall be with mounting as required, for ceiling mounting. Device color shall be red for wall mounted applications, and white for ceiling mounted applications.

2. It shall consist of a 4" voice evacuation speaker with multi-tap transformer with a UL1971/ADA Compliant Strobe. Strobe intensity to be provided as required by NFPA 72. Light intensities shown on drawings shall be used only as a basis for design. Field survey and adjust, if necessary, at no additional costs.

3. The speaker/strobe shall interface with the Notifier Dual Synchronization Module to provide synchronized operation.

4. The unit shall be semi-flush mounted, if possible.

5. If the unit is to be surface mounted, install the matching backbox skirt provided by the equipment manufacturer. The surface backbox shall be a finished product. Painted 4" square electrical boxes shall not be permitted.

6. Provide 4" speaker support bracket for drop ceiling installations.

G. Remote Audio/Visual Signal Power Supply

1. The unit to be provided shall be Notifier, 6A/24VDC, Addressable Charger/Power Supply with built-in signal synchronization modules.

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2. The ACPS shall provide (5) fully addressable control inputs, one for each output circuit that are activated through the signaling line circuit in the fire alarm panel, one for synchronized horn input, and one monitor point for power supply trouble.

3. The use of separate addressable control modules, monitor modules, and synchronization modules shall be forbidden. Any fire alarm system that must be configured this way for proper operation is not acceptable.

4. It shall be possible to interconnect ACPS power supplies so that signal synchronization between power supplies can be provided.

5. The ACPS shall mount in cabinet with (2) 7AH to 25AH batteries. Secondary power supply shall provide for (24) hours of standby operation followed by (5) minutes of alarm operation.

6. All communications inputs to the ACPS from the fire alarm control panel, and all outputs from the ACPS to the fire alarm control panel, shall be accomplished over the fire alarm system signaling line circuit(s).

SECTION 5 – WIRING

5.1 INSTALLER'S RESPONSIBILITIES

A. The installer shall coordinate the installation of the fire alarm equipment with the manufacturer's authorized representative.

B. All conductors and wiring shall be installed according to the manufacturer's recommendations.

C. It shall be the Installer's responsibility to coordinate with the supplier, regarding the correct wiring procedures before installing any conduits or conductors.

5.2 INSTALLATION OF SYSTEM COMPONENTS

A. System components shall be installed in accordance with the latest revisions of the appropriate NFPA pamphlets, the requirements contained herein, National Electrical Code, local and state regulations, the requirements of the fire department, and other applicable authorities having jurisdiction (AHJ).

B. All wiring shall be type FPLP for plenum installations. All fire alarm cable shall be installed above the acoustic ceiling or contained in building walls. Where a device is mounted on a masonry wall, install conduit stub within wall from device backbox to top of wall. All wiring shall be concealed and all backboxes recessed, where possible. Where wiring cannot be concealed, install cables in Wiremold 500 (Public Areas) EMT (Mechanical spaces) conduit. Where device backbox cannot be recessed in walls, provide the manufacturer's matching surface backbox.

C. Where wiring is run above acoustic ceiling, crawl spaces and pipe tunnels install cables in bridle rings connected to building steel supports. Install bridle ring every 6 feet. Cables shall not be ty-rapped to any pipes.

D. For fire alarm use, wire and cable shall be U.L. listed and be plenum rated, type FPLP.

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E. Raceway containing conductors identified as “Fire Protective Alarm System” conductors shall not contain any other conductors and no AC current carrying conductors shall be allowed in the same raceway with the DC fire alarm detection and signaling conductors.

F. It shall be the responsibility of the contractor to coordinate the exact location of all installed equipment with all applicable trades.

G. Smoke and/or heat detectors shall be located 3 or more feet from any supply or return air register. Coordinate with mechanical contractor prior to final installation.

5.3 SPARE EQUIPMENT

A. The Electrical Contractor shall furnish up to ten (10) in any combination of fire alarm devices selected by Owner, including but not limited to, smoke, heat, duct monitor module, control monitor module or audio/visual devices for Owner spare.

SECTION 6 – ADDITIONAL SERVICES, GUARANTEE AND FINAL TEST

6.1 GENERAL

A. The contractor shall guarantee all equipment and wiring to be free from inherent mechanical and electrical defects for one (1) year (365 days) from the date of final acceptance.

B. In addition to the equipment shown on the project drawings, include five (5) additional peripheral devices of any type (i.e.: smoke detector, duct smoke detector, heat detector, pull station, monitor module, relay module, control module, horn/strobe, speaker/strobe, strobe, etc.). These devices may be installed at the discretion of the local Fire Marshal, the project engineer, or the licensed fire alarm company, upon review and/or testing performed by all.

If necessary, these devices, along with the required panel additions, wiring, labor, etc., shall be furnished and installed at no additional cost to the owner. If, at the end of the project, they are not required to be installed, they shall be given to the owner for their use.

C. Concurrent with the warranty period, the licensed fire alarm contractor shall provide (2) semi-annual inspections of the completed fire alarm system in accordance with the State of Delaware Fire Prevention Regulations. All costs shall be included in the contract amount. No additional fees will be paid by the owner for this service.

6.2 FINAL TEST

Before the installation shall be considered complete and acceptable by the awarding authority, a test on the system shall be performed as follows:

A. The contractor's job foreman, in the presence of a representative of the owner, and the fire marshal's office shall operate every building fire alarm device to ensure proper operation and correct annunciation at each remote annunciator and control panel.

B. One half (1/2) of all tests shall be performed on battery standby power.

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C. Where application of heat would destroy any detector, it may be manually activated.

D. When the testing has been completed to the satisfaction of both the contractor's job foremen and the representatives of the manufacturer and owner, a State of Delaware "Fire Alarm Signaling System Certificate of Installation" shall be completed and signed by the necessary personnel.

E. The contractor shall leave the fire alarm system in proper working order, and without additional expense to the owner, shall replace any defective materials or equipment provided by him under this contract within one (1) year (365 days) from the date of final acceptance by the awarding authority. Warranty work shall be completed during normal business hours, a maximum of 24 hours after notification of the service request.

F. Provide service response within (1) hour during a "false alarm" condition.

6.3 AS BUILT DRAWINGS, TESTING, and MAINTENANCE INSTRUCTIONS

A. As Built Drawings

A complete set of reproducible "as-built" drawings showing installed wiring, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of system.

B. Operating and Instruction Manuals

Three (3) complete sets of operating and instruction manuals, each placed in a 3-ring binder, shall be delivered to the owner upon completion. Each manual shall contain a copy of the as-built fire alarm system drawings. The instruction period for the owner or it's representatives shall be 4 hours, performed during normal business hours.

C. Testing Frequency Instructions

1. Complete, accurate step-by-step testing instructions giving recommended and required testing frequency of all equipment, methods for testing each individual piece of equipment, and a complete trouble-shooting manual explaining how to test the primary internal parts of each piece of equipment shall be delivered to the owner upon completion of the system.

2. Maintenance instructions shall be complete, easy to read, understandable, and shall provide the following information:

   - Instruction on replacing any components of the system, including internal parts.
   - Instructions on periodic cleaning and adjustment of equipment with a schedule of these functions.

   A complete list of all equipment and components with information as to the address and phone number of both the manufacturer and local supplier of each item.

3. User operating instructions shall be provided, and prominently displayed on the cabinet front or on a separate sheet located next to the fire alarm control unit, in accordance with UL Standard #864.

END OF SECTION

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